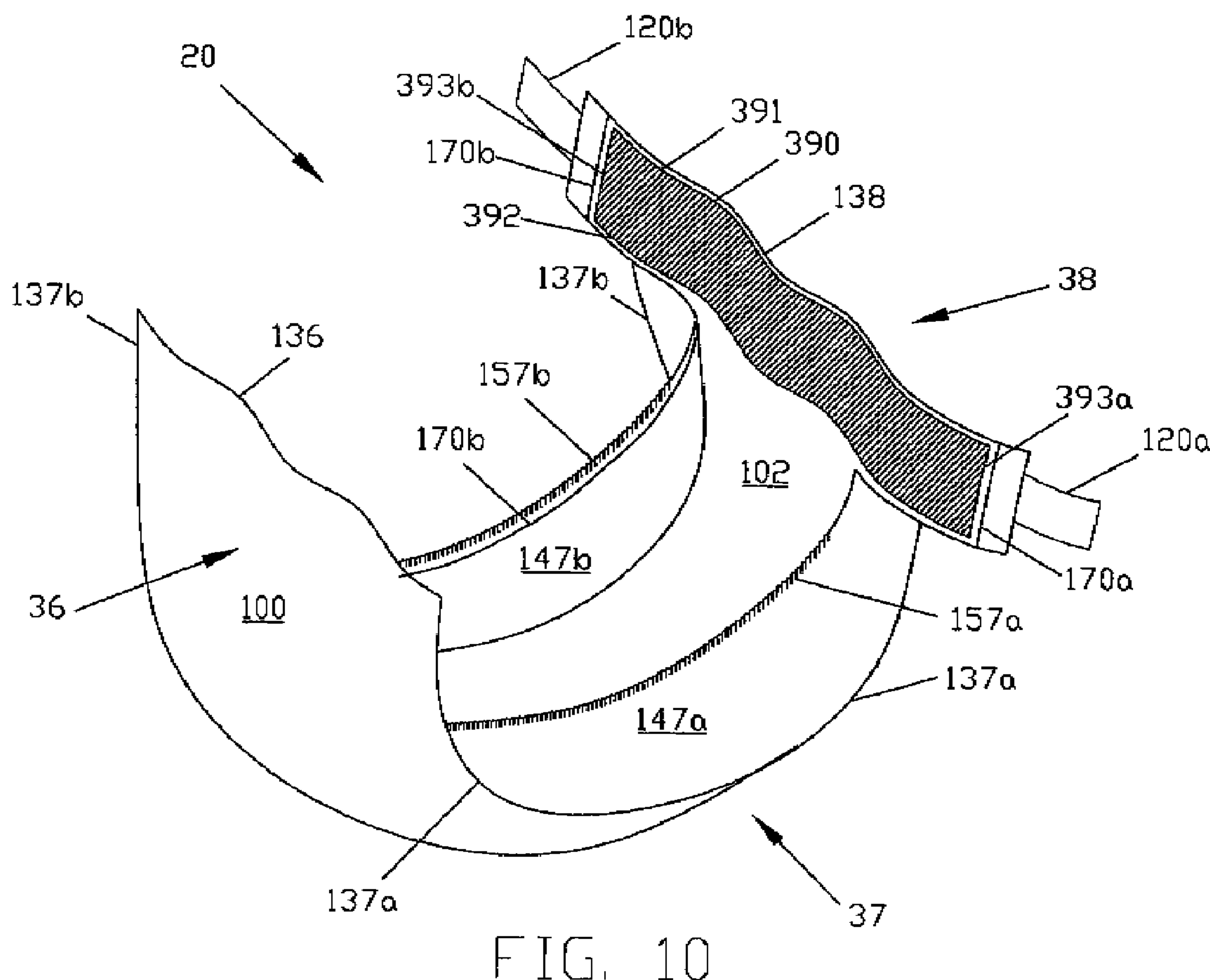




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(54) Titre : COUCHE JETABLE A OREILLETES DE CHASSIS DEPLOYABLES ET A CEINTURE ETIRABLE
 (54) Title: DIAPER HAVING DEPLOYABLE CHASSIS EARS AND STRETCH WAISTBAND



(57) **Abrégé/Abstract:**

A disposable diaper including a chassis and an absorbent assembly. The chassis includes laterally opposing side flaps formed by laterally inwardly folded portions of the chassis and deployable chassis ears formed by other laterally inwardly folded portions of the

(57) **Abrégé(suite)/Abstract(continued):**

chassis. Each chassis ear is held laterally inwardly folded until being released and unfolded laterally outward so as to project laterally outward beyond the adjacent side flap. An elastically extensible stretch waistband overlies portions of the laterally opposing chassis ears and extends laterally across the waist region between them.

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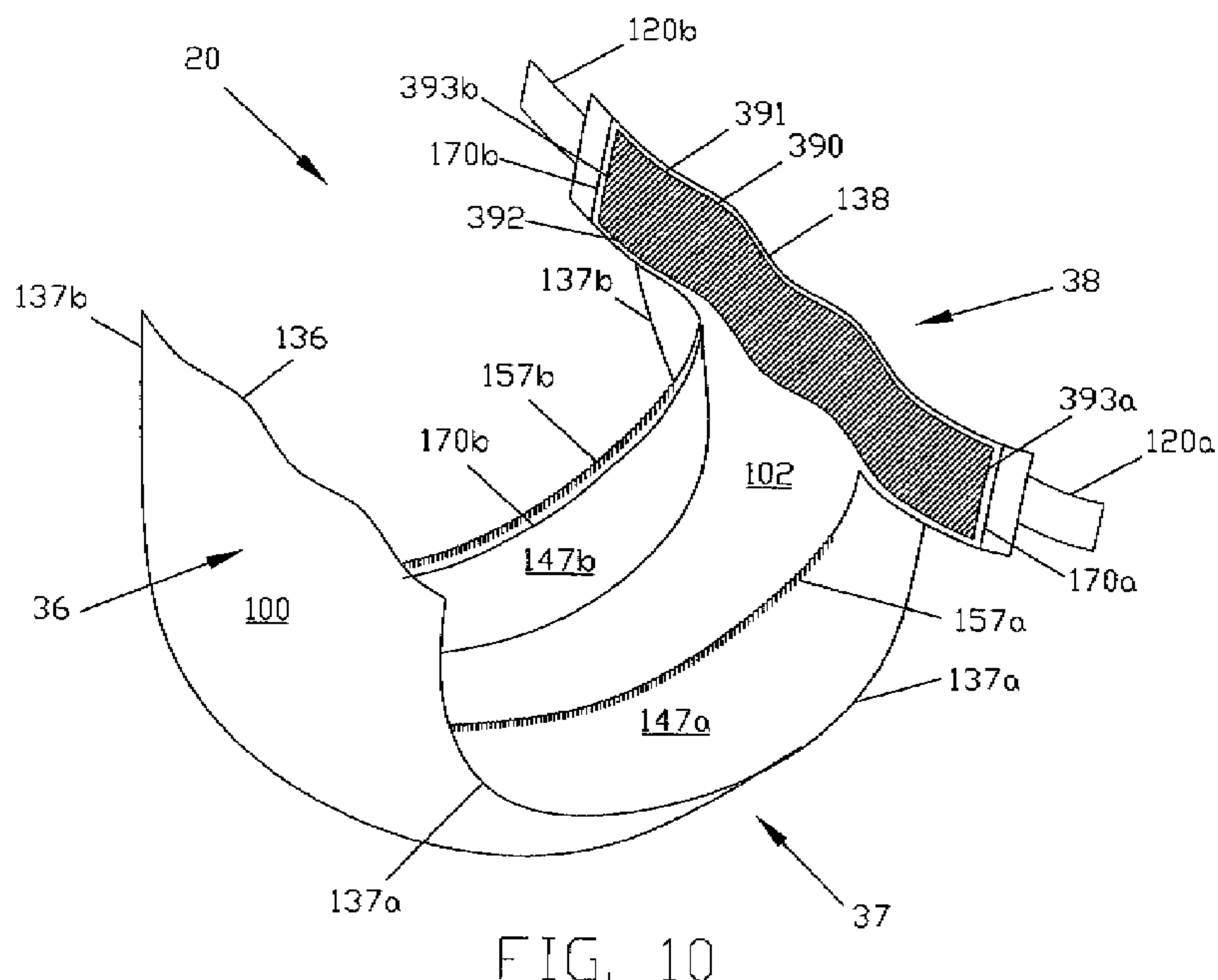


FIG. 10

(57) Abstract: A disposable diaper including a chassis and an absorbent assembly. The chassis includes laterally opposing side flaps formed by laterally inwardly folded portions of the chassis and deployable chassis ears formed by other laterally inwardly folded portions of the chassis. Each chassis ear is held laterally inwardly folded until being released and unfolded laterally outward so as to project laterally outward beyond the adjacent side flap. An elastically extensible stretch waistband overlies portions of the laterally opposing chassis ears and extends laterally across the waist region between them.

WO 2008/118713 A1

WO 2008/118713 A1



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DIAPER HAVING DEPLOYABLE CHASSIS EARS AND STRETCH WAISTBAND

FIELD OF THE INVENTION

This invention relates to disposable absorbent articles such as disposable diapers and other articles intended for use on incontinent persons.

BACKGROUND OF THE INVENTION

Disposable absorbent articles are designed to absorb and contain bodily waste in order to prevent soiling of the body and clothing of the wearer, as well as bedding or other objects with which the wearer comes into contact.

As the usage of disposable absorbent articles has expanded, their complexity has increased with the incorporation of additional features serving to enhance their performance and appearance. The costs of the materials and the costs of the manufacturing processes have also increased in conjunction with the increase in complexity. As a result, the prices at which these articles are sold have risen to levels that many potential purchasers around the world cannot afford to pay. Thus, a need exists for a simple disposable absorbent article.

SUMMARY OF THE INVENTION

A disposable diaper includes a chassis and an absorbent assembly. The chassis includes laterally opposing side flaps formed by laterally inwardly folded portions of the chassis and deployable chassis ears formed by other laterally inwardly folded portions of the chassis. Each chassis ear is held laterally inwardly folded until being deployed by being released and unfolded laterally outward so as to project laterally outward beyond the adjacent side flap. Fastening elements may be disposed on at least two of the chassis ears, the fastening elements being adapted for fastening the front waist region to the back waist region to encircle a waist and legs of a wearer. An elastically extensible stretch waistband overlies portions of the laterally opposing chassis ears and extends laterally across the waist region between them. The absorbent assembly may be attached in a cruciform pattern to the chassis to allow portions of the chassis underlying the absorbent assembly and lying outside the cruciform attachment pattern to extend laterally.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawing figures, like reference numerals identify structurally corresponding elements, which may or may not be identical in the several exemplary embodiments that are depicted. Some of the figures may have been simplified by the omission of selected elements for the purpose of more clearly showing other elements. Such omissions of elements in some figures are not necessarily indicative of the presence or absence of particular elements in any of the exemplary embodiments, except as may be delineated explicitly in the corresponding written description.

In the drawing figures and in the written description, lowercase letters appended to reference numerals indicate generally symmetric elements, *e.g.*, left and right symmetric elements may be respectively identified by the reference numerals **1a** and **1b**. A reference numeral without an appended lowercase letter identifies all of the elements to which that particular reference numeral applies, *e.g.*, the same elements as a group may be designated **1**.

Figure 1 is a plan view of an exemplary disposable absorbent article in the form of a diaper **20**, which is shown in its flat, uncontracted state, *i.e.*, without the contraction induced by elastic members. In this figure, the interior portion of the diaper **20** that faces inwardly toward the wearer and contacts the wearer is shown facing the viewer.

Figure 2 is a plan view of another exemplary diaper **20** with the interior portion of the diaper **20** that faces inwardly toward the wearer shown facing the viewer.

Figure 3 is a section view of the diaper **20** of **Figures 1** and **2** taken at the section line **3-3**.

Figure 4 is a section view of the diaper **20** of **Figures 1** and **2** taken at the section line **4-4**.

Figure 5 is a plan view of the exemplary diaper **20** with two chassis ears extending laterally. In this figure, the interior portion of the diaper **20** is shown facing the viewer.

Figure 6 is a plan view of the diaper **20** of **Figure 5** with the exterior portion of the diaper **20** shown facing the viewer.

Figure 7 is a section view of the diaper **20** of **Figures 5** and **6** taken at the section line **7-7**.

Figure 8 is a section view of the diaper **20** of **Figures 5** and **6** taken at the section line **8-8**.

Figure 9 is a section view of the diaper **20** of **Figures 5** and **6** taken at the section line **9-9**.

Figure 10 is a perspective view of an exemplary diaper **20**, which is shown in its relaxed, contracted state, *i.e.*, with the contraction induced by elastic members. In this figure, the interior portion of the diaper **20** is shown facing upward.

Figure 11 is plan view of another exemplary diaper **20** showing an alternative form of fasteners.

Figure 12 is a plan view of the diaper **20** of **Figure 11** with the exterior portion of the diaper **20** shown facing the viewer.

Figure 13 is a section view of the diaper **20** of **Figures 11** and **12** taken at the section line **13-13**.

Figure 14 is a section view of the diaper **20** of **Figures 11** and **12** taken at the section line **14-14**.

Figure 15 is a section view of another exemplary diaper **20** taken at a section line similar to **13-13** and showing an alternative form of fasteners.

Figure 16 is a section view of the diaper **20** of **Figures 11** and **12** taken at the section line **16-16**.

Figure 17 is a plan view of an exemplary fragment of a formed web material.

Figure 18 is a simplified plan view of an exemplary diaper **20**, which is shown in its flat, uncontracted state, *i.e.*, without the contraction induced by elastic members, having the absorbent assembly attached to the chassis in a cruciform attachment pattern. In this figure, the exterior portion of the diaper **20** is shown facing the viewer.

Figure 19 is a plan view of an exemplary absorbent assembly **200**. In this figure, the absorbent assembly **200** is shown separately from a chassis **100** to which it is attached in an exemplary diaper **20** and the interior portion of the absorbent assembly **200** that faces inwardly toward the wearer and contacts the wearer is shown facing the viewer.

Figure 20 is a section view of the absorbent assembly **200** of **Figure 19** taken at the section line **20-20**.

Figure 21 is a section view of the absorbent assembly **200** of **Figure 19** taken at the section line **21-21**.

Figure 22 is a section view of another exemplary absorbent assembly **200** taken at a section line similar to **20-20**.

Figure 23 is a section view of an exemplary absorbent core **250**.

Figure 24 is a plan view of another exemplary diaper **20** with four chassis ears extending laterally. In this figure, the interior portion of the diaper **20** is shown facing the viewer.

Figure 25 is a section view of a laminate stretch waistband.

Figure 26 is a view of the laminate stretch waistband of **Figure 25** in a stretched condition.

DETAILED DESCRIPTION OF THE INVENTION

In this description, the following terms have the following meanings:

The term “absorbent article” refers to a device that absorbs and contains liquid, and more specifically, refers to a device that is placed against or in proximity to the body of a wearer to absorb and contain the various exudates discharged from the body.

The term “diaper” refers to an absorbent article that is generally worn by infants and incontinent persons about the lower torso so as to encircle the waist and the legs of the wearer and that is specifically adapted to receive and contain urinary and fecal waste.

The term “disposable” refers to the nature of absorbent articles that generally are not intended to be laundered or otherwise restored or reused as an absorbent article, *i.e.*, they are intended to be discarded after a single use and, preferably, to be recycled, composted or otherwise disposed of in an environmentally compatible manner. In this description, a disposable diaper is described as being representative of an exemplary disposable absorbent article.

The term “deploy” in all its forms refers to the manipulation of any disclosed deployable structural element from its initial configuration to a configuration in which it can be used for its intended purpose in the article on which it is provided.

The term “longitudinal” refers to a direction running from a waist edge to an opposing waist edge of the article and generally parallel to the maximum linear dimension of the article.

The term “lateral” refers to a direction running from a side edge to an opposing side edge of the article and generally at a right angle to the longitudinal direction.

The term “circumferential” refers to a direction encircling a portion or all of the waist of the wearer generally parallel to the lateral direction. This term is used particularly when describing the elements that extend around and form the margin of the waist opening.

The term “disposed” refers to an element being attached and positioned in a particular place or position in a unitary structure with other elements.

The term “attach” refers to elements being connected or united by fastening, adhering, bonding, *etc.* by any method suitable for the elements being attached together and their constituent materials. Many suitable methods for attaching elements together are well-known, including adhesive bonding, pressure bonding, thermal bonding, mechanical fastening, *etc.* Such attachment methods may be used to attach elements together over a particular area either continuously or intermittently. Unless indicated otherwise, elements that are described as being attached to each other are attached directly together, with either nothing or only bonding material, *e.g.*, an adhesive, between them. Unless indicated otherwise, elements that are described as being attached to each other are attached permanently together, *i.e.*, attached in such

a way that one or both of the elements and/or any bonding material that is present must be damaged in order to separate them. This permanent attachment excludes temporary attachment, such as by means of fasteners that may be unfastened.

The term “lamine” refers to elements being attached together in a layered arrangement.

The term “cohesive” refers to the property of a material that, once set, sticks to itself but does not to any significant degree stick to other materials.

The terms “water-permeable” and “water-impermeable” refer to the penetrability of materials in the context of the intended usage of disposable absorbent articles. Specifically, the term “water-permeable” refers to a layer or a layered structure having pores, openings, and/or interconnected void spaces that permit liquid water to pass through its thickness in the absence of a forcing pressure. Conversely, the term “water-impermeable” refers to a layer or a layered structure through the thickness of which liquid water cannot pass in the absence of a forcing pressure. A layer or a layered structure that is water-impermeable according to this definition may be permeable to water vapor, *i.e.*, may be “water vapor-permeable”. Such a water vapor-permeable layer or layered structure is commonly known in the art as “breathable”. As is well known in the art, a common method for measuring the permeability to water of the materials typically used in absorbent articles is a hydrostatic pressure test, also called a hydrostatic head test or simply a “hydrohead” test. Suitable well known compendial methods for hydrohead testing are approved by INDA (formerly the International Nonwovens and Disposables Association, now The Association of the Nonwoven Fabrics Industry) and EDANA (European Disposables And Nonwovens Association).

The terms “proximal” and “distal” refer respectively to the location of an element relatively near to or far from the center of a structure, *e.g.*, the laterally proximal edge of a longitudinally extending element is located nearer to the longitudinal axis than the laterally distal edge of the same element is located relative to the same longitudinal axis. When used to describe relative locations with respect to the axes, synonyms include “inboard” and “outboard”, respectively.

The terms “interior” and “exterior” refer respectively to the location of an element that is intended to be placed against or toward the body of a wearer when an absorbent article is worn and the location of an element that is intended to be placed against or toward any clothing that is worn over the absorbent article. Synonyms for “interior” and “exterior” include, respectively, “inner” and “outer”, as well as “inside” and “outside”. Also, when the absorbent article is oriented such that its interior faces upward, *e.g.*, when it is laid out in preparation for setting the

wearer on top of it, synonyms include “upper” and “lower”, “above” and “below”, “over” and “under”, and “top” and “bottom”, respectively.

The term “nonwoven” refers to a sheet, web, or batt of directionally or randomly oriented fibers, made by bonding or entangling the fibers through mechanical, thermal, or chemical means. Nonwoven materials exclude paper and products which are woven, knitted, tufted, or felted by wet milling. The fibers are preferably but not necessarily man-made synthetics.

The term “stretch waistband” refers to a structural component that resists elongation by providing a contractive force around the waist opening of a diaper when it is expanded circumferentially, *i.e.*, when the waist regions of the diaper are expanded laterally.

As can be seen in the drawing figures, one end portion of the exemplary diaper **20** is configured as a front waist region **36**, the longitudinally opposing end portion is configured as a back waist region **38**, and an intermediate portion is configured as a crotch region **37**.

The basic structure of the diaper **20** includes a chassis **100**, which has a laterally extending front edge **136**, a longitudinally opposing back edge **138**, laterally opposing side edges **137**, an interior surface **102**, and an exterior surface **104**. A longitudinal axis **42** extends through the midpoints of the front edge **136** and the back edge **138** and a lateral axis **44** extends through the midpoints of the side edges **137**. The exemplary chassis **100** shown in **Figure 1** additionally has longitudinally extending and laterally opposing side flaps **147** as well as laterally opposing chassis ears **106** and/or **108**, which are described in more detail below.

The basic structure of the diaper **20** also includes an absorbent assembly **200** that is attached to the chassis **100**. The absorbent assembly **200** absorbs and retains liquid bodily waste materials. The absorbent assembly **200** has a laterally extending front edge **236**, a longitudinally opposing back edge **238**, laterally opposing side edges **237**, an interior surface **202**, and an exterior surface **204**. The absorbent assembly **200** may be disposed either symmetrically or asymmetrically with respect to either or both of the longitudinal axis **42** and the lateral axis **44**. For example, the absorbent assembly **200** shown in **Figure 1** is disposed symmetrically with respect to the longitudinal axis **42** and asymmetrically offset toward the front waist region **36** with respect to the lateral axis **44**.

The edges of the absorbent assembly **200** may lie inward of the respective edges of the chassis **100**, as in the exemplary diaper **20** shown in **Figure 1**. Such a configuration in which one or more of the edges of the absorbent assembly **200** lies inward of the corresponding edges of the chassis **100** may be desirable, for example, in order to allow the relatively more flexible layer or layers adjacent to the edges of the chassis to conform to the body of the wearer and

thereby form effective gasket-like seals against the skin of the wearer without being constrained by a relatively thicker and relatively less flexible absorbent assembly. Alternatively, one or more of the edges of the absorbent assembly **200** may coincide with the corresponding edge or edges of the chassis **100**.

When the diaper **20** is worn on the lower torso of a wearer, the front waist edge **136** and the back waist edge **138** encircle the waist of the wearer, while at the same time the chassis side edges **137** encircle the legs of the wearer, the crotch region **37** is generally positioned between the legs of the wearer, and the absorbent assembly **200** extends from the front waist region **36** through the crotch region **37** to the back waist region **38**.

The basic structure of the diaper **20** also includes at least one stretch waistband that is attached to the chassis **100** in a waist region. When the chassis **100** is stretched in the circumferential direction, the stretch waistband resists by providing a contractive force around the waist opening of the diaper **20**. For example, in **Figure 1**, an interior back stretch waistband **390** is shown attached interiorly to the chassis **100** in the back waist region **38** of the diaper **20**. This back stretch waistband **390** has a laterally extending longitudinally distal edge **391** and a longitudinally opposing laterally extending proximal edge **392**.

The chassis **100** includes a water-impermeable backsheet **26**. The backsheet **26** forms an exterior surface that is intended to be placed toward any clothing that is worn over the diaper **20**. Many suitable materials for use as the backsheet **26** are well-known, including films of polyethylene and other polyolefins. Multi-layer backsheets, such as laminates of a film and a nonwoven, are also well-known and may be suitable for use as the backsheet **26**. Such a laminate backsheet may be oriented with the nonwoven **31** disposed exteriorly, as shown in **Figure 16**, to provide the feel and appearance of a more cloth-like outermost layer than would be provided by using the film **30** as the outermost layer.

The chassis **100** may, but need not, additionally include an inner liner **22** attached to the backsheet **26**. Such an inner liner **22** is preferably formed of a soft material that will not irritate the skin of the wearer. Many suitable materials for the inner liner **22** are well-known in the art, including rayon and synthetic nonwovens such as spunbonded or carded polypropylene, polyethylene, or polyester. An inner liner **22** may form a portion of the interior surface **102** of the chassis **100**, such as in the respective front and back laterally central portions **117** and **118** between the edges **236** and **238** of the absorbent assembly **200** and the waist edges **136** and **138** of the chassis **100** and thereby serve to isolate the skin of the wearer from a portion of the

backsheet **26** as may be desirable, for example, when the diaper **20** is worn under conditions in which contact between the skin and a backsheet film could be uncomfortable.

As shown in the figures, the exemplary chassis **100** has longitudinally extending and laterally opposing side flaps **147** that are disposed on the interior portion of the diaper **20** that faces inwardly toward the wearer and contacts the wearer. The side flaps **147** are formed by folding portions of the chassis **100** laterally inward, *i.e.*, toward the longitudinal axis **42**, to form both the respective side flaps **147** and the side edges **137** of the chassis **100**, as shown in the figures. Each side flap **147** has a proximal edge **157**.

In the exemplary diaper **20** shown in **Figure 1**, the side flaps **147** overlap the absorbent assembly **200**, *i.e.*, their proximal edges **157** lie laterally inward of the respective side edges **237** of the absorbent assembly **200**. Such an overlapped configuration may be desirable in order to impart a more finished appearance to the diaper **20** than that imparted by a non-overlapped configuration. Alternatively, the side flaps **147** may not overlap the absorbent assembly **200**.

Each side flap **147** is attached to the interior surface **102** of the chassis **100** in an attachment zone **153** in the front waist region **36** and in a longitudinally opposing attachment zone **154** in the back waist region **38**, as shown in detail in **Figure 9**. In embodiments in which the front edge **236** or the back edge **238** of the absorbent assembly **200** coincides with the respective front waist edge **136** or back waist edge **138** of the chassis **100** and the side flaps **147** overlap the absorbent assembly **200**, the side flaps **147** may be attached to the absorbent assembly **200** instead of, or in addition to, being attached to the interior surface **102** of the chassis **100**.

Between these attachment zones, the proximal edge **157** of each side flap **147** remains free, *i.e.*, not attached to the interior surface **102** of the chassis **100** or to the absorbent assembly **200**. Also between the attachment zones, an elastic strand **167** is attached adjacent to the proximal edge **157** of each side flap **147**. Each elastic strand **167** is enclosed inside a hem **170** formed adjacent to the proximal edge **157** of each side flap **147**. When stretched, the elastic strand **167** allows the adjacent side flap edge to extend to the flat uncontracted length of the chassis. When allowed to relax, the elastic strands **167** contract and gather the proximal edges **157**, thereby lifting the side flaps **147** into position to serve as side barriers adjacent to the side edges **237** of the absorbent assembly **200**, as shown in **Figure 8** and **Figure 10**.

Another elastic strand **168** may be attached where the chassis **100** is folded to form the side flap **147**, as shown in **Figure 5** and **Figure 8**. When allowed to relax, this elastic strand **168** may gather the side edge **137** of the chassis **100** to form a side barrier at or adjacent to the side edge **137**.

In the finished diaper, it is preferable that the chassis have side edges **137** that are not straight, but instead are notched, thereby giving an overall shape in plan view of a “T” or of an “I” to the diaper **20**. Such a non-rectangular configuration may impart a tailored appearance to the diaper **20** when it is worn and may also impart an impression that the diaper **20** will fit comfortably between the legs of a wearer.

An exemplary non-rectangular configuration of the chassis is shown in **Figure 5** and **Figure 6**. As shown in these figures, laterally opposing portions **108** of the chassis **100** in the back waist region **138** may extend laterally outward while the adjacent side flaps **147** remain folded laterally inward. The laterally outwardly extending portions form a pair of back chassis “ears” **108** that impart a “T” shape to the diaper. Alternatively, laterally opposing portions of the chassis **100** in the front waist region **136** may extend laterally outward to form a pair of front chassis ears and thereby impart a “T” shape to the diaper. As another alternative, both front portions and back portions may extend laterally outward to form both a pair of front chassis ears **106** and a pair of back chassis ears **108** while the adjacent side flaps **147** remain folded laterally inward, in which configuration an “I” shape is imparted to the diaper **20**, as shown in **Figure 24**.

For ease of manufacturing and packaging, it is preferable that the chassis ears **106** and/or **108** remain folded laterally inward until a user desires to deploy them for use when applying the diaper **20** onto the body of a wearer. For this purpose, as shown in **Figure 1**, one edge of each chassis ear may be defined by a frangible line of attachment **91** along which the chassis ear can be partially detached for deployment, *i.e.*, for unfolding laterally outward. Such a frangible line of attachment may be formed in a layer or a laminate of layers by perforation, by the formation of a brittle area or areas at which the material will preferentially fracture when stressed, by the formation of a weaker area or areas at which the material will preferentially tear when stressed, by the formation of a friable area or areas at which the material will preferentially crumble when stressed and/or bent, or by any other method of providing frangibility that is suitable for the materials involved.

Alternatively, as shown in **Figure 2**, one edge of each chassis ear may be defined by a cut line **92** at which the chassis ear is severed from the adjacent side flap **147**. Because the formation of this cut line could allow the chassis ear to unfold prematurely, the chassis ear may be held laterally inwardly folded by a releasable attachment member **94** until being deployed by being released and unfolded laterally outward so as to project laterally outward beyond the adjacent side flap. As shown in **Figure 4**, the releasable attachment member **94** may include a releasable attachment element **95** disposed on the chassis ear and a complementary releasable

attachment element **96** disposed on the interior surface underlying the chassis ear when it is laterally inwardly folded. Alternatively, a single attachment member disposed on either the chassis ear or the underlying interior surface may engage the material of the other surface releasably, thereby making a distinct complementary attachment member unnecessary, *e.g.*, a hook member may engage a nonwoven material releasably. Such a releasable attachment member **94** may also be used in combination with a chassis ear that is defined by a frangible line of attachment **91** if additional assurance is desired that the chassis ear will not inadvertently be deployed prematurely.

As shown in the figures, each stretch waistband has a circumferentially extending longitudinally distal edge that is disposed adjacent to the respective waist edge of the chassis **100** and a longitudinally opposing circumferentially extending longitudinally proximal edge that is disposed relatively nearer to the lateral axis **44** than the longitudinally distal edge of the stretch waistband is disposed. Each stretch waistband also has laterally opposing longitudinally extending side edges, an interior surface, and an exterior surface.

For example, the back interior stretch waistband **390** shown in **Figure 5** has a circumferentially extending longitudinally distal edge **391**, a longitudinally opposing circumferentially extending longitudinally proximal edge **392**, and laterally opposing longitudinally extending side edges **393**. The interior surface **394** and the exterior surface **395** of this back interior stretch waistband **390** are identified in **Figure 7**. Similarly, the back exterior stretch waistband **380** shown in **Figure 6** has a longitudinally distal edge **381**, a longitudinally opposing proximal edge **382**, laterally opposing side edges **383**, an interior surface **384**, and an exterior surface **385**. As another example, the front interior stretch waistband **370** shown in **Figure 24** has a longitudinally distal edge **371**, a longitudinally opposing proximal edge **372**, and laterally opposing side edges **373**.

Each of the stretch waistbands shown in the figures has a circumferential extent such that it overlies a portion of each of the paired chassis ears and extends continuously between them. For example, the back interior stretch waistband **390** shown in **Figure 5** overlies the majority of each of the back chassis ears **108** and extends across the back waist region **38** between these chassis ears **108**. In particular, the side edges **393** of this back interior waistband **108** lie adjacent to and laterally inboard of the hems **170** of the chassis ears **108**.

In some embodiments, a stretch waistband may have a relatively greater or a lesser circumferential extent than the stretch waistbands shown in the figures. For example, the side edges of a stretch waistband may lie laterally inboard of any fasteners disposed on the chassis

ears, such as the fasteners **120** shown in **Figure 5**. As another example, the side edges of a stretch waistband may lie relatively more distally than shown in the figures, such that the stretch waistband overlies substantially the entire lateral extents of the chassis ears.

The interior surface of an interior stretch waistband contacts the skin of the wearer when the diaper **20** is worn. Therefore, the layer forming the interior surface is preferably formed of a soft material that will not irritate the skin of the wearer. Many suitable materials are known in the art, including rayon and synthetic nonwovens, such as spunbonded or carded polypropylene, polyethylene, or polyester or other olefinic materials.

A stretch waistband may have a laminate structure. In particular, a stretch waistband may include an interior layer and an additional layer or layers disposed exteriorly of the interior layer. An elastic version of one of the aforementioned suitable materials such as, a nonwoven, exhibiting substantial elastic properties, may be used for any of the layers. For example, a front interior stretch waistband **370** having a laminate structure is shown in **Figure 25**. This stretch waistband includes both an interior skin-contacting layer **82** and an elastic layer **83** laminated to the interior layer **82**. Suitable materials for the elastic layer **83** are well-known in the art, including natural rubber strands, synthetic rubber strands, elastomeric films, *etc.* The material chosen for the elastic layer **83** preferably exhibits a force response proportional to its elongation. As shown in **Figure 25**, a stretch waistband may also include an exterior cover layer **84** laminated to the elastic layer **83** on its surface opposite the interior layer **82**, thereby forming a trilaminate in which the elastic layer **83** is sandwiched between the interior layer **82** and the exterior cover layer **84**.

The layers of a stretch waistband may be laminated by any method(s) suitable for the elements being attached together and their constituent materials. For example, the elastic layer **83** may be maintained in a stretched condition while being attached to a relaxed interior layer **82** (and a relaxed exterior cover layer **84** if present) and then allowed to relax. The resultant contraction of the elastic layer **83** may gather the interior layer **82** in such a way as to create rugosities and the laminate thus formed may be extended in the direction of the original stretch up to the original dimension of the interior layer **82** (and the exterior cover layer **84** if present) with only the elastic layer **83** resisting the extension. A similar result may be achieved by, for example, first gathering the interior layer **82** (and the exterior cover layer **84** if present), such as by pleating it, and then attaching the elastic layer **83** in a relaxed condition. The resultant laminate may be extended in a direction perpendicular to the pleat ridges up to the original

dimension of the interior layer **82** (and the exterior cover layer **84** if present) with only the elastic layer **83** resisting the extension.

In some exemplary methods, the lamination may be performed with both the elastic layer **83** and the interior layer **82** (and the exterior cover layer **84** if present) relaxed. All or a portion of the resultant laminate stretch waistband may subsequently be “activated” by subjecting it to elongation to create localized ruptures in a portion **85a** of the interior layer **82** (and a portion **85c** of the exterior cover layer **84** if present). In **Figure 26**, the front interior stretch waistband **370** of **Figure 25** having such an activated portion **85** is shown in a stretched condition. The ruptured portion **85a** of the interior layer **82** and the ruptured portion **85c** of the exterior cover layer **84** are shown in dashed lines representing exemplary breaks in and/or separation of the fibers in nonwoven materials. The ruptured portion **85a** of the interior layer **82** (and the ruptured portion **85c** of the exterior cover layer **84** if present) in the resultant activated portion **85** of the laminate provides little or no resistance to extension in the direction of the original elongation. For example, when a nonwoven is used for the interior layer **82** (and the exterior cover layer **84** if present), the ruptured portion(s) typically include(s) breaks in and/or separation of the fibers that render the ruptured portion(s) substantially incapable of transmitting tensile forces in the plane of the nonwoven. Some suitable activation methods are known in the art as “ring-rolling” processes.

A stretch waistband may have uniform extension characteristics throughout its area or may have different extension characteristics in different portions. For example, a portion of a stretch waistband may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of an adjacent portion, such that a desired fit on a wearer can be achieved. The difference in extensibility may be provided by varying the lamination process, for example by varying the localized elongation in an activation process.

Portions of the diaper **20** can be fastened together to encircle the waist and the legs of the wearer in many well-known ways. For example, separate fastening devices such as safety pins, separate tapes, a separate tie strap or straps, and/or a separate belt can be used for this purpose. Alternatively or in addition, fastening elements can be incorporated into the chassis **100** to enable a user to apply the diaper **20** to the body of the wearer without, or in conjunction with, any separate fastening devices. Many suitable types of such incorporated fastening elements are well-known, including, for example, tapes, adhesives, adhesive tape tabs, ties, buttons, hooks, loops, snap fasteners, other forms of mechanical fasteners, cohesive patches, *etc.* When

configured for use, these incorporated fastening elements may project laterally or longitudinally outward or they may lie entirely inside the edges of the diaper **20**.

For example, laterally opposing fastening elements may be attached to the chassis ears. The fastening elements **120** shown in the figures are disposed on the back chassis ears **108** and may be used to fasten the back waist region **38** to the front waist region **36** in a back-over-front manner. Alternatively, similar fastening elements may be disposed on front chassis ears **106** and used to fasten the front waist region **36** to the back waist region **38** in a front-over-back manner. As yet another alternative, similar fastening elements may be disposed on a waist region not having chassis ears extending from it and may be used to attach that waist region to chassis ears extending from the opposing waist region.

The fastening elements **120** shown in **Figure 5** and **Figure 6** project laterally outward from the chassis ears **108** in the form of tapes. Such tapes may be coated with an adhesive. In order to prevent their premature adhesion to a surface, such adhesive tape fastening elements are typically folded over to prevent exposure of the adhesive and subsequently unfolded to expose the adhesive for use. For example, in **Figure 3**, both fastening elements **120** are shown folded, while in **Figure 5**, **Figure 6**, and **Figure 7**, the left fastening element **120a** is shown still folded and the right fastening element **120b** is shown unfolded and thereby configured for use.

Optionally, a fastening sheet (not shown) may be attached onto the exterior surface **104** of the chassis **100**, as described in U.S. Patent Application Publication No. 2005/0171499A1. When a fastening sheet is provided, adhesive fastening elements may be adhered to the fastening sheet to fasten the back waist region **38** and the front waist region **36** together, or mechanical fastening elements may engage with it for the same purpose. The incorporation of such a fastening sheet may be desirable, for example, in order to make it possible to use a relatively inexpensive and relatively weak material for the backsheet **26**.

Complementary fastening elements, such as those described in U.S. Patent Application Publication No. 2005/0171499A1, may likewise be used. For example, as shown in **Figure 11**, **Figure 12**, **Figure 13**, and **Figure 14**, back fastening elements **120** may be disposed on back chassis ears **108** and complementary front fastening elements **110** may be disposed in the front waist region **36**. Suitable complementary fastening elements may be formed from cohesive fastening patches, mechanical fasteners such as hooks and loops, or other known fastening elements.

Alternatively, when a laminate backsheet is used and is oriented with the nonwoven disposed exteriorly, some forms of mechanical fasteners that typically require specific mating

fastener elements, such as hooks that typically mate with loops, may be configured to engage with the nonwoven and thereby make the inclusion of the specific mating fastener element unnecessary. For example, as shown in **Figure 15**, the fastening elements **120** may be formed by hook fastening patches configured to engage with the nonwoven layer **31** of the laminate backsheet **26**. Such hook fastening elements may be disposed similarly to the cohesive fastening patch fastening elements shown in **Figure 13**.

As described in U.S. Patent Application Publication No. 2005/0171499A1, a portion or the whole of the chassis **100** may be made extensible to a degree greater than the inherent extensibility of the material or materials from which the chassis is made, *e.g.*, the backsheet **26**, the inner liner **22**, or both. The additional extensibility may be desirable in order to allow the chassis **100** to conform to the body of a wearer during movement by the wearer. The additional extensibility may also be desirable, for example, in order to allow the user of a diaper **20** including a chassis **100** having a particular size before extension to extend the front waist region **36**, the back waist region **38**, or both waist regions of the chassis **100** to encircle the waist of an individual wearer whose waist circumference falls within a predefined range, *i.e.*, to tailor the diaper to the individual wearer. Such extension of the waist region or regions may give the diaper a generally hourglass shape, so long as the crotch region **37** is extended to a relatively lesser degree than the waist region or regions, and may impart a tailored appearance to the diaper **20** when it is worn. In addition, the additional extensibility may be desirable in order to minimize the cost of the diaper. For example, an amount of material that would otherwise be sufficient only to make a relatively smaller diaper lacking this extensibility can be used to make a diaper capable of being extended to fit a wearer who is larger than the unextended smaller diaper would fit. In other words, a lesser amount of material is needed in order to make a diaper capable of being properly fitted onto a given size of a wearer when the material is made extensible as described.

Additional lateral extensibility in the chassis **100** may be provided in a variety of ways. For example, a material or materials from which the chassis **100** is made may be pleated by any of many known methods. Alternatively, all or a portion of the chassis may be made of a formed web material or a formed laminate of web materials like those described in U.S. Patent No. 5,518,801. An exemplary fragment **300** of such a formed web material **305** is shown in **Figure 17**. This formed web material **305** includes distinct laterally extending regions **310** in which the original material has been altered by embossing or another method of deformation to create a pattern of generally longitudinally oriented alternating ridges **312** and valleys **314** in the web.

The formed web material **305** also includes laterally extending unaltered regions **316** located between the laterally extending altered regions **310**. The formed web material can be extended in a direction perpendicular to the ridges, up to the point where the ridges and valleys flatten, with substantially less force than is required to extend beyond that point. Thus, such formed web materials exhibit an extensible behavior resembling that of traditional elastic materials, but may be made of relatively less expensive materials that are not inherently elastic and, thus, their use may provide an advantage in terms of the cost of manufacturing the absorbent articles.

The front laterally central portion **117** and/or the back laterally central portion **118** of the chassis **100** may have a different range of extensibility from the portions of the chassis in the attachment zones **153** and **154** where the side flaps **147** are attached to the interior surface **102** of the chassis. Additionally or alternatively, either or both of the laterally central portions **117** and **118** may be extensible to a greater or lesser degree when subjected to a given level of opposing tensile forces, *i.e.*, may be more easily or less easily extensible, than the portions of the chassis in the attachment zones. Similarly, the altered regions in the laterally central portions of the chassis may be deformed to a greater or a lesser degree than the altered regions in the attachment zones to render the laterally central portions more easily or less easily extensible than the respective portions in the attachment zones.

The portion of the chassis **100** underlying the stretch waistband may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of an adjacent portion of the chassis, such that a lateral extension of each of the portions to its maximum extensibility facilitates application of the diaper **20** onto the body of a wearer by allowing the waist regions to be fitted properly to the wearer's waist. In particular, the area underlying and/or adjacent to the stretch waistband may be made more highly extensible than other regions of the chassis to maximize the allowable range of extension of the stretch waistband.

As shown in **Figure 19**, **Figure 20**, **Figure 21**, and **Figure 22**, the absorbent assembly **200** includes an absorbent core **250**. The absorbent core **250** has a laterally extending front edge **256**, a longitudinally opposing back edge **258**, a left side edge **257a**, and a laterally opposing right side edge **257b**. Any or all of the edges of the absorbent core **250** may lie inward of, or may coincide with, the respective edges of the absorbent assembly **200**. For example, in the exemplary absorbent assembly **200** shown in **Figure 19**, the side edges **257** of the absorbent core **250** are located laterally inward of the side edges **237** of the absorbent assembly **200**, while the front edge **256** and back edge **258** of the absorbent core **250** coincide with the respective front edge **236** and back edge **238** of the absorbent assembly **200**.

The absorbent assembly **200** may be attached to the chassis **100** over any part or the whole of the area of the absorbent assembly **200**. Preferably, the absorbent assembly **200** is attached on its exterior surface **204** to the chassis **100** in a cruciform attachment pattern, *i.e.*, in an attachment pattern that forms or is arranged in a cross or “+” shape. The cruciform attachment pattern may be contiguous, *i.e.*, all of its portions may be touching or connected throughout the pattern in an unbroken sequence. Alternatively, the cruciform attachment pattern may include detached portions and thereby lack contiguity but still be arranged such that the shape of the overall pattern is a cruciform. For example, a discontinuous cruciform attachment pattern may include a longitudinally extending portion disposed along the longitudinal axis and separate left and right laterally distal portions disposed along or adjacent to the lateral axis and thereby form a cruciform as the shape of the overall pattern. Within the extent of the cruciform attachment pattern **210**, the absorbent assembly **200** may be attached to the chassis **100** continuously or intermittently, such as in the form of dots, stripes, beads, spirals, *etc.*

An exemplary contiguous cruciform attachment pattern **210** is shown in **Figure 18**, **Figure 19**, **Figure 20**, **Figure 21**, and **Figure 22**. The portions **190** of the chassis **100** that lie outside such a cruciform attachment pattern are not restrained by attachment to the absorbent assembly **200** and therefore remain extensible. In particular, a relatively narrow longitudinally extending portion **212** of a cruciform attachment pattern **210** like that shown in **Figure 18**, **Figure 19**, and **Figure 21** leaves the majority of the width of the chassis **100** in the front waist region **36** and in the back waist region **38** freely extensible and thereby allows extension of the chassis **100** in the lateral direction in these regions. A relatively wide laterally extending portion **214** of a cruciform attachment pattern **210** like that shown in **Figure 18**, **Figure 19**, **Figure 20**, and **Figure 22** prevents the portion of the chassis **100** in the crotch region **37** to which the absorbent assembly **200** is attached from shifting relative to the absorbent assembly **200** in that region. A relatively wide laterally extending portion **214** of a cruciform attachment pattern **210** may also contribute to the effectiveness of the side flaps **147** when the elastic strands **167** lift the proximal edges **157** into contact with the body of the wearer, by supporting the crotch region **37** and thereby preventing the side flaps **147** from distorting and failing to maintain contact with the body.

The cruciform attachment pattern **210** may be disposed either symmetrically or asymmetrically with respect to either or both of the longitudinal axis **42** and the lateral axis **44** of the chassis **100**. For example, the cruciform attachment pattern **210** shown in **Figure 19** is disposed symmetrically with respect to the longitudinal axis **42** and asymmetrically offset toward

the front waist region **36** relative to the lateral axis **44**. In addition, the cruciform attachment pattern **210** may be disposed symmetrically or asymmetrically with respect to either or both of the side edges **237** and the front edge **236** and the back edge **238** of the absorbent assembly **200**. Suitable configurations of cruciform attachment patterns are disclosed in U.S. Patent No. 6,962,578.

The absorbent core **250** may be disposed between a lower covering sheet that is disposed on the exterior face of the absorbent core **250** in a face-to-face arrangement with the interior surface **102** of the chassis and an upper covering sheet that is disposed on the interior face of the absorbent core **250**. Such an upper covering sheet and lower covering sheet may be attached together to contain the absorbent core **250** between them and thereby form the absorbent assembly **200**. For example, in the exemplary absorbent assembly **200** shown in the figures, an upper covering sheet **24** and a lower covering sheet **25** are attached together at or adjacent to the side edges **237** of the absorbent assembly **200** in adhesive attachment zones **29**. Alternatively, the upper covering sheet **24** and the lower covering sheet **25** may be attached together in places other than the side edges **237** of the absorbent assembly **200**, *e.g.*, at or adjacent to the end edges **236** and **238**, or at or adjacent to both the end edges **236** and **238** and the side edges **237**.

The upper covering sheet **24** is water-permeable and allows liquid waste to pass through to the absorbent core **250**, where the liquid waste is absorbed. The lower covering sheet **25** may be water-impermeable, but is preferably water-permeable. The upper covering sheet **24** may form the interior surface **202** of the absorbent assembly **200** that is intended to be placed against the body of the wearer and therefore is preferably formed of a soft material that will not irritate the skin of the wearer. Many materials that are suitable for a water-permeable covering sheet are well-known in the art, including synthetic nonwovens such as spunbonded or carded polypropylene, polyester, or rayon.

The absorbent core may include an acquisition component in addition to one or more storage components. The absorbent core acquisition component serves to acquire deposited liquid bodily waste material and transfer it to the absorbent core storage component. Preferred materials for the acquisition component include synthetic fiber materials, open celled polymeric foam materials, fibrous nonwoven materials, cellulosic nonwoven materials, and various combination synthetic/cellulosic nonwoven materials. Examples of such acquisition materials are more fully described in U.S. Patent No. 4,950,264. Such an absorbent core **250** including an acquisition component **290** overlying an absorbent core storage component **272** is shown in **Figure 22**. A separation sheet **292** of, *e.g.*, a tissue or a nonwoven material, may be disposed

between the absorbent core storage component **272** and the absorbent core acquisition component **290** to help ensure that none of the gel formed by a superabsorbent polymer that may be included in the absorbent core storage component reaches the skin of the wearer.

Suitable well-known absorbent materials for the absorbent core include cellulose fibers in the form of comminuted wood pulp, which is commonly known as “airfelt”, layers or sheets of natural or synthetic fibrous material, superabsorbent polymer, *etc.* These absorbent materials may be used separately or in combination and many may be used in a discrete form, *i.e.*, in the form of fibers, granules, particles, layers and the like.

The discrete form of an absorbent material may be immobilized in pockets formed by a layer of a thermoplastic material, such as a hot melt adhesive, that intermittently contacts and adheres to a substrate, such as a covering sheet, while diverging away from the substrate at the pockets. Absorbent assemblies having such pocket structures are described in detail in U.S. Patent Application Publications Nos. 2004/0167486 and 2004/0162536. An exemplary absorbent assembly **200** having such a structure is shown in **Figure 23**. In this absorbent assembly **200**, the absorbent core **250** includes particles of superabsorbent polymer **270** that are contained inside pockets **280** formed by a layer **275** of a thermoplastic material. This absorbent core **250** contains no cellulose fibers. Alternatively, the absorbent core **250** may include both particles of superabsorbent polymer and airfelt and both materials may be contained inside the pockets. As shown in **Figure 23**, the layer **275** of the thermoplastic material intermittently contacts and adheres to the lower covering sheet **25** at the areas of attachment **282**. Between the areas of attachment **282**, the layer **275** diverges away from the lower covering sheet **25** to form the pockets **280**. The layer **275** may have the form of a sheet of fibers of the thermoplastic material through which the liquid waste may pass to the particles of superabsorbent polymer **270** to be absorbed. In **Figure 23**, a separate upper covering sheet **24** is shown overlying the layer **275** of the thermoplastic material. Alternatively, the separate upper covering sheet **24** may be omitted and the layer **275** in the form of a fibrous sheet may serve as the upper covering sheet **24**.

The disclosures of all patents, patent applications and any patents which issue thereon, as well as any corresponding published foreign patent applications, and all publications listed and/or referenced in this description, are hereby incorporated in their entireties herein by reference. It is expressly not admitted that any of the documents or any combination of the documents incorporated herein by reference teaches or discloses the present invention. In the

case of any conflict between the definitions of terms, the usage in this description overrides the conflicting usage in any incorporated reference.

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 spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A disposable diaper (20) comprising:
 - a chassis (100) having a front waist region (36), a back waist region (38), and a crotch region(37) between the waist regions, laterally opposing side edges (137) defining its width, longitudinally opposing front and back waist end edges (136, 138) defining its length, an interior surface (102) and an exterior surface (104); and
 - an absorbent assembly (200) attached to the interior surface of the chassis, the absorbent assembly having side edges (237) and end edges (236, 238) disposed proximally relative to the respective side edges and end edges of the chassis,
 - the chassis including a water-impermeable backsheet (26) and laterally opposing side flaps (147) formed by laterally inwardly folded portions of the chassis in at least the crotch region, each side flap being attached to the interior surface adjacent to its longitudinally distal ends and having a longitudinally extending elastic gathering member (167) attached adjacent to its proximal edge (157),
 - the chassis also including at least one pair of laterally opposing deployable chassis ears (108) formed by laterally inwardly folded portions of the chassis in at least one of the waist regions, each chassis ear being held laterally inwardly folded until being deployed by being unfolded laterally outward so as to project laterally outward beyond the respective side flap; and
 - at least one stretch waistband (370, 390) attached to the chassis in at least one of the waist regions, the stretch waistband overlying at least a portion of each of the pair of chassis ears and extending continuously therebetween laterally, the stretch waistband providing a contractive force when the respective waist region is expanded laterally.
2. The disposable diaper of Claim 1 wherein each chassis ear is held laterally inwardly folded by a frangible line of attachment (91) until being detached at the frangible line and unfolded laterally outward.
3. The disposable diaper of Claim 1 wherein each ear is held laterally inwardly folded by a releasable attachment member (94) until being released at the attachment member and unfolded laterally outward.

4. The disposable diaper of Claim 3 wherein the releasable attachment member comprises complementary releasable attachment elements (95, 96) disposed respectively on the chassis ear and on the interior surface underlying the laterally inwardly folded chassis ear.
5. The disposable diaper of any preceding claim comprising two of the stretch waistbands.
6. The disposable diaper of Claim 5 wherein one of the two stretch waistbands is disposed in the back waist region and the other of the two stretch waistbands is disposed in the front waist region.
7. The disposable diaper of Claim 5 wherein one of the two stretch waistbands is disposed interiorly and the other of the two stretch waistbands is disposed exteriorly.
8. The disposable diaper of Claim 5 wherein the two stretch waistbands are disposed in the same one of the waist regions.
9. The disposable diaper of any preceding claim wherein the stretch waistband comprises a trilaminate including an interior layer (82), an exterior cover layer (84), and an elastic layer (83) sandwiched between the interior layer and the exterior cover layer.
10. The disposable diaper of Claim 9 wherein the trilaminate includes an activated portion (85) in which a ruptured portion (85a) of the interior layer and a ruptured portion (85c) of the exterior cover layer provide substantially no resistance to elongation and the elastic layer provides the contractive force.

1/16

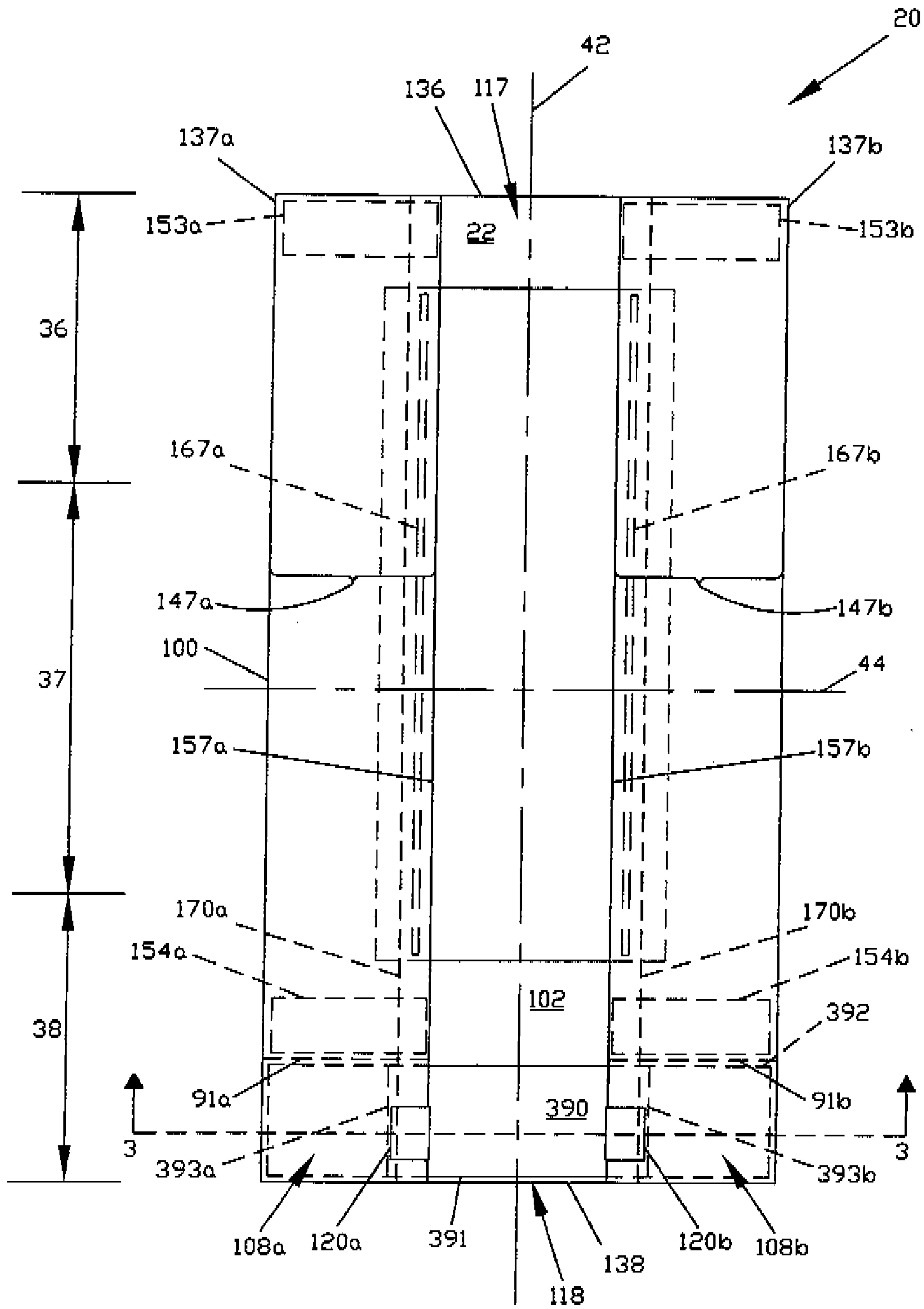


FIG. 1

2/16

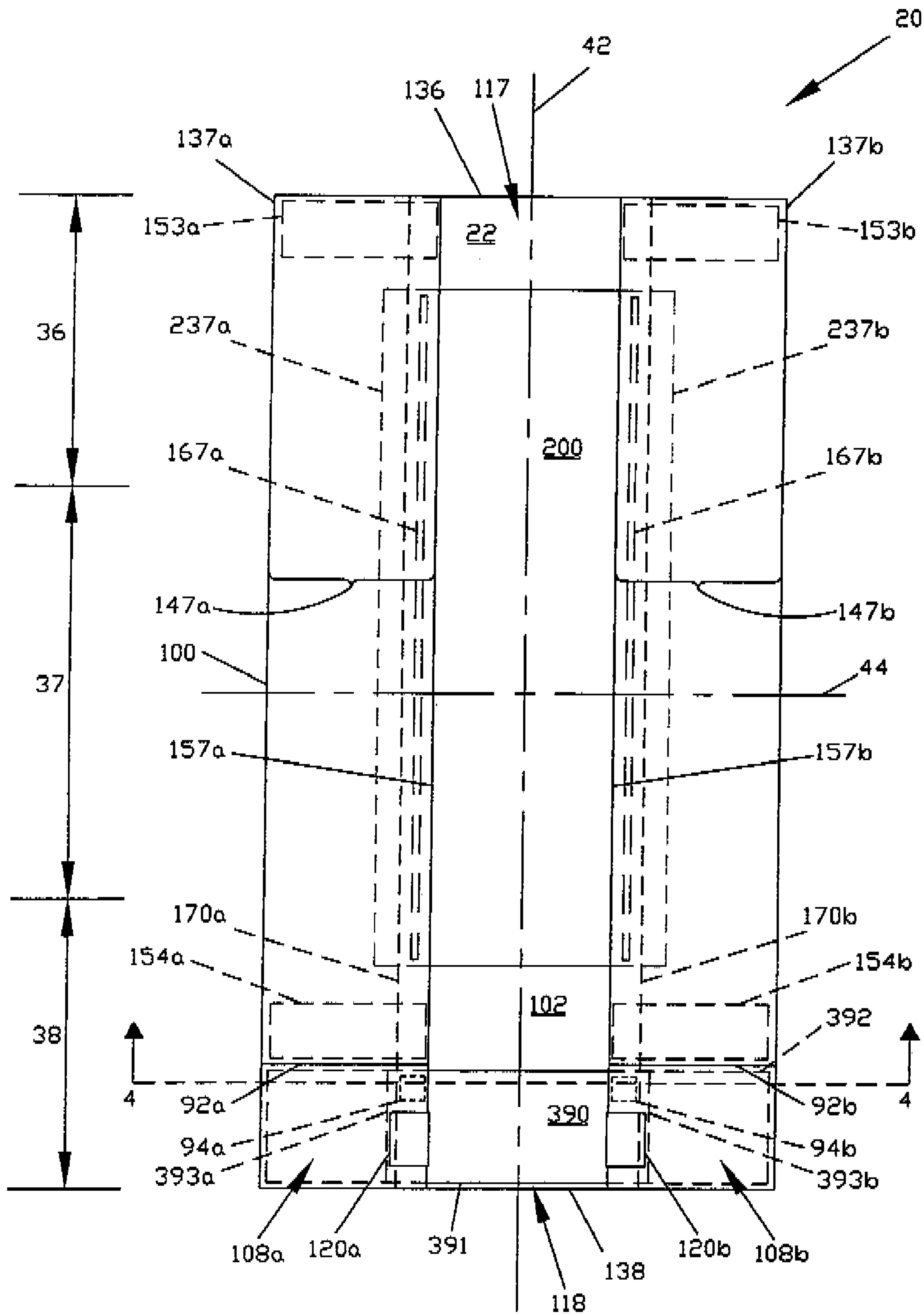


FIG. 2

3/16

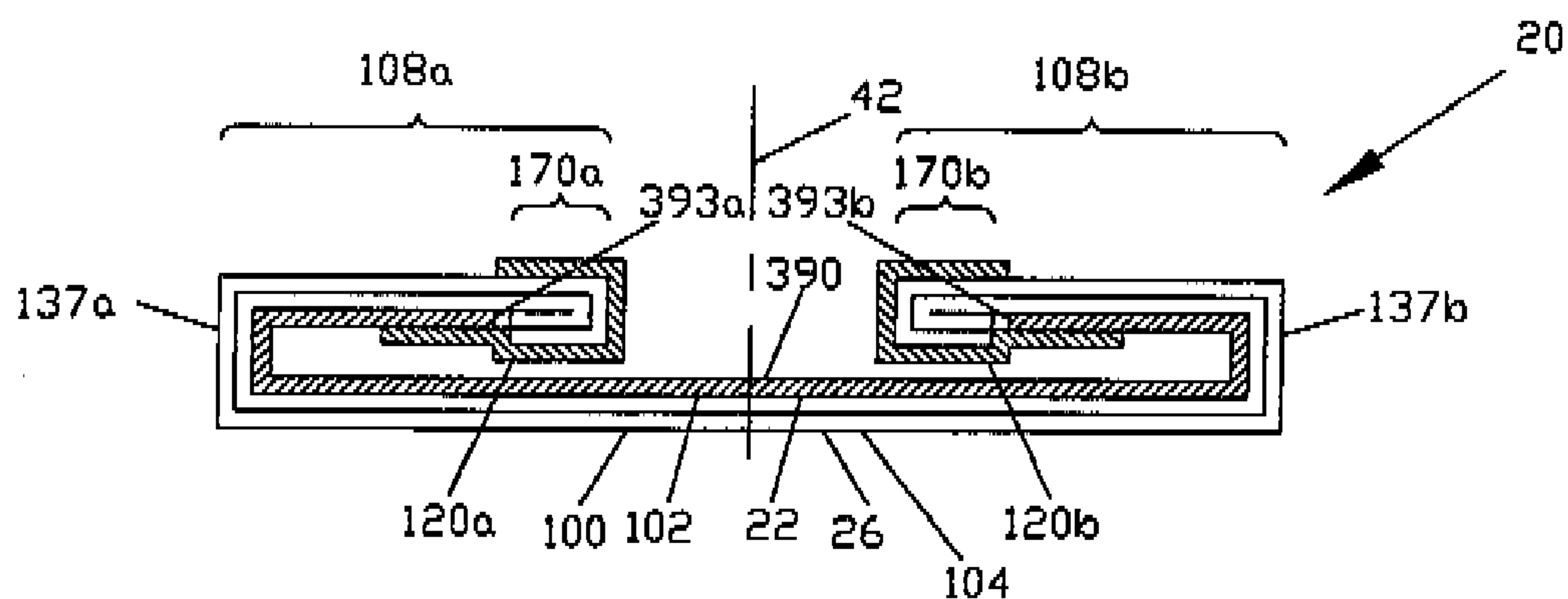


FIG. 3

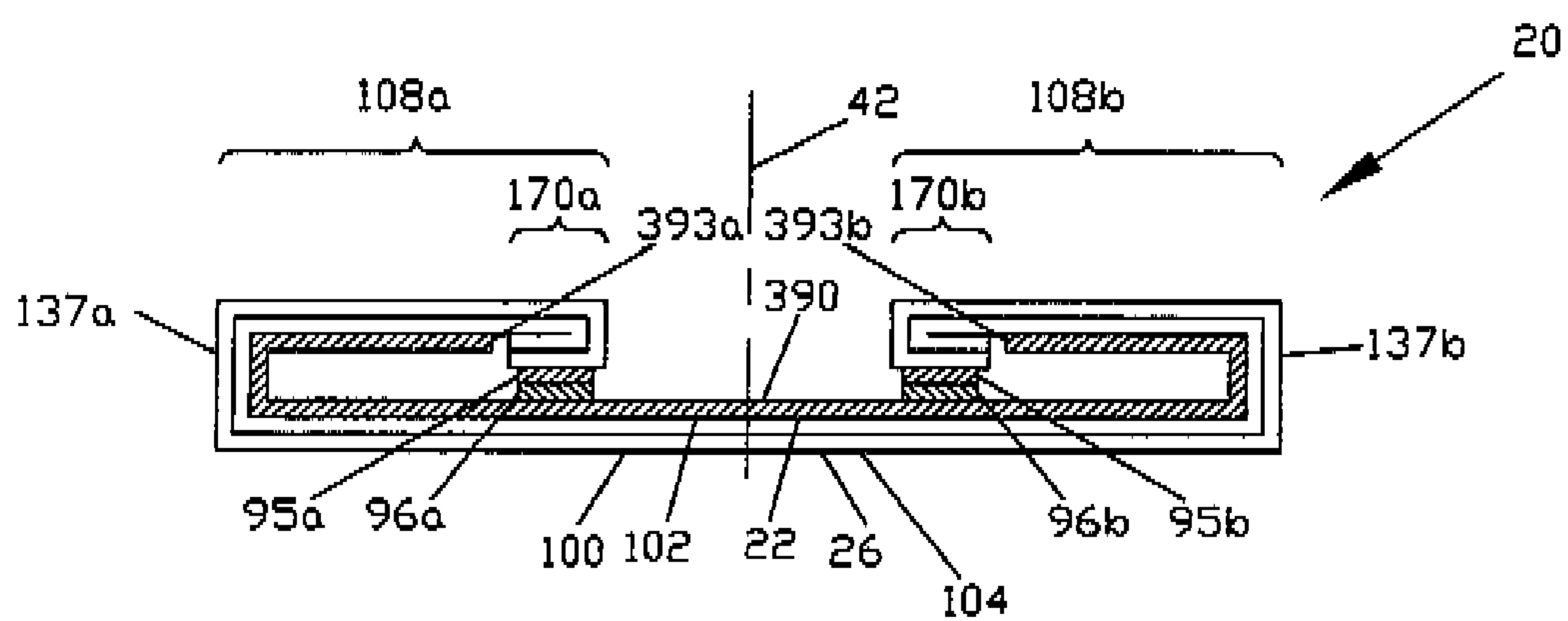


FIG. 4

4/16

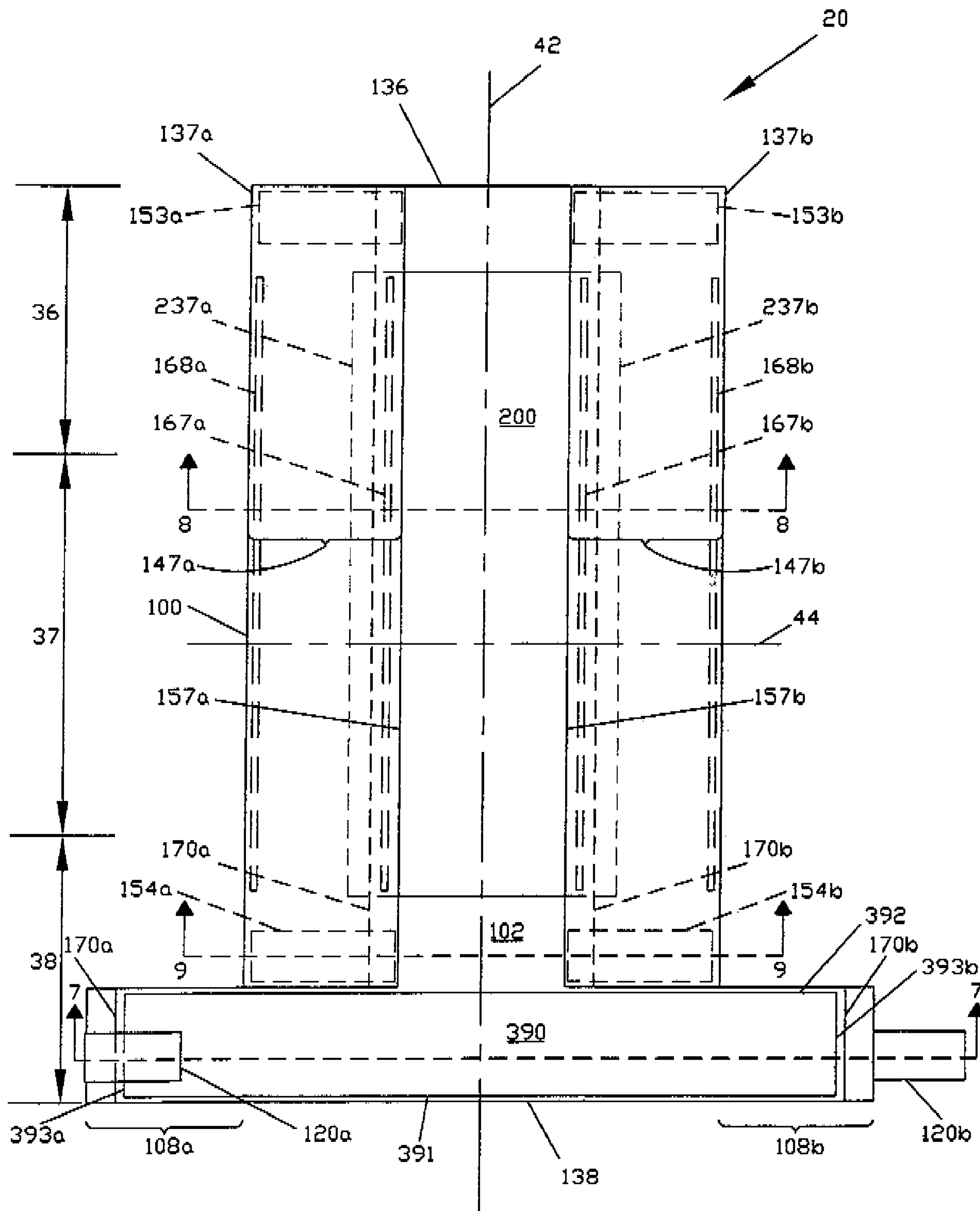


FIG. 5

5/16

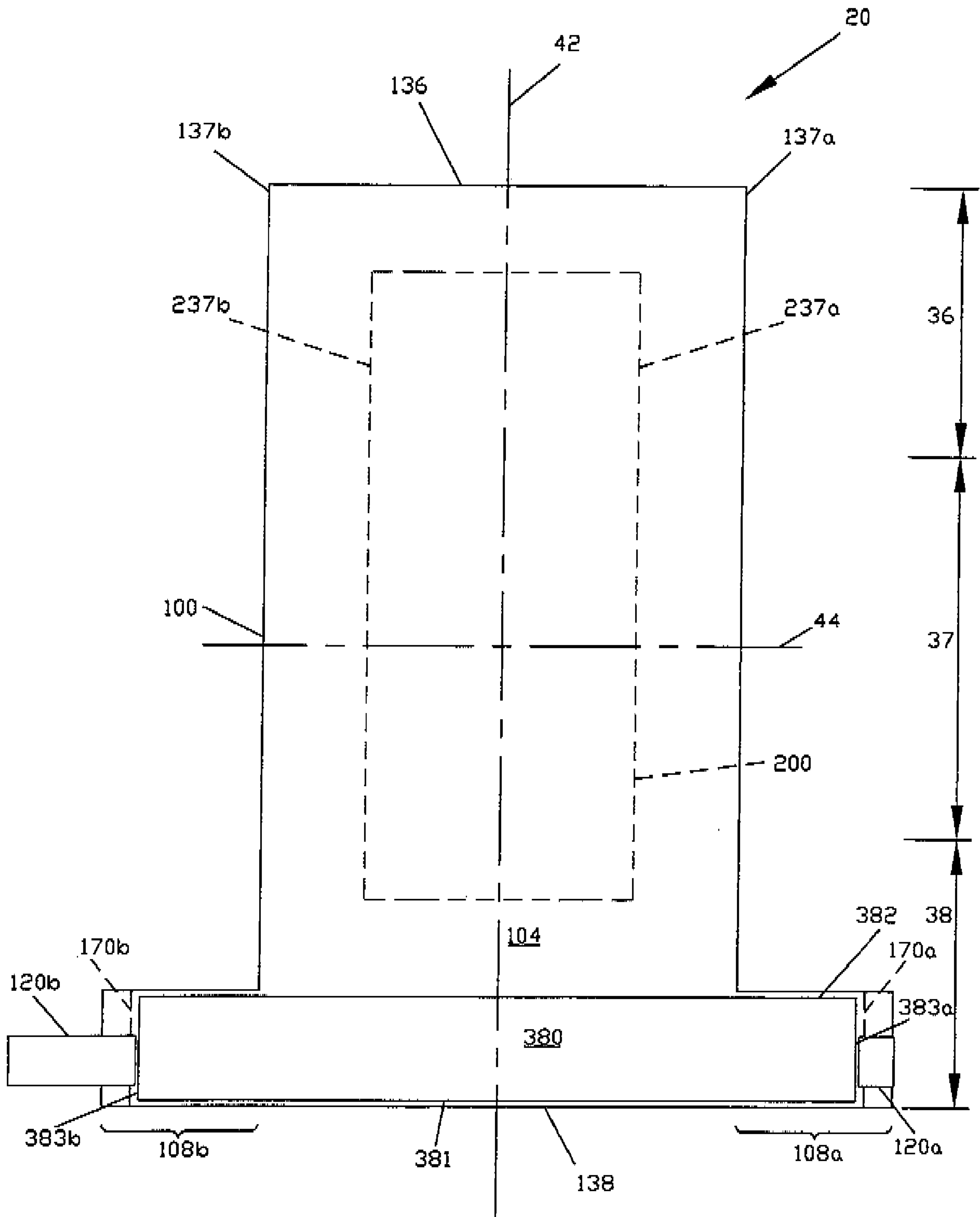


FIG. 6

6/16

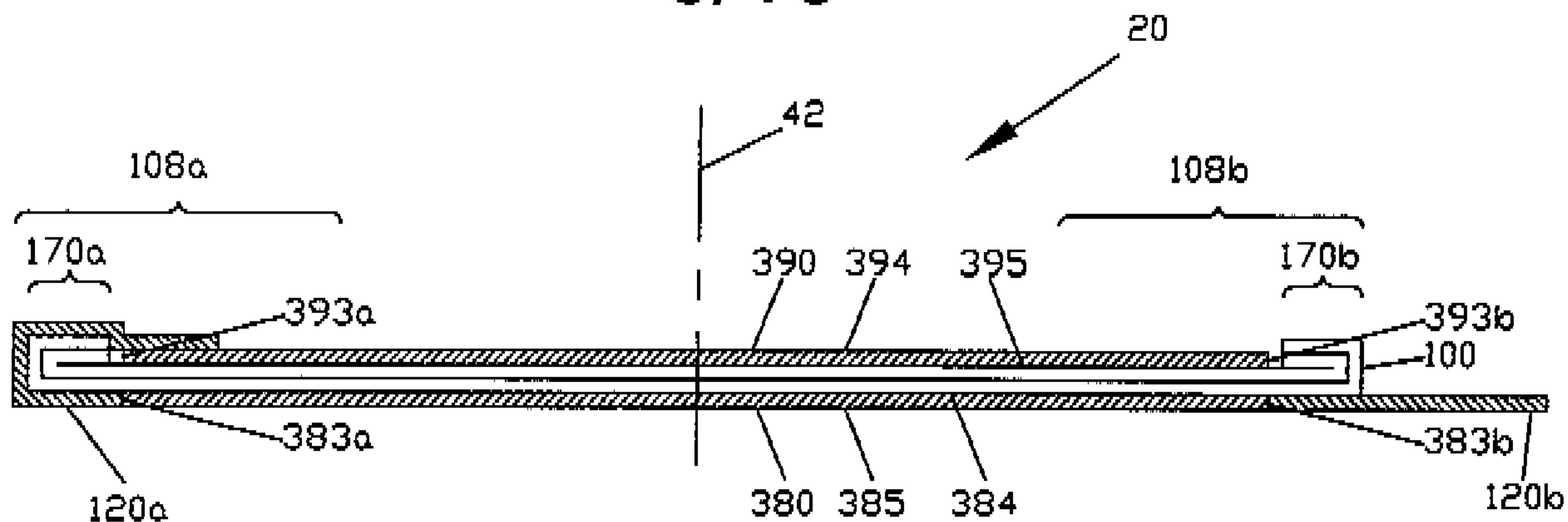


FIG. 7

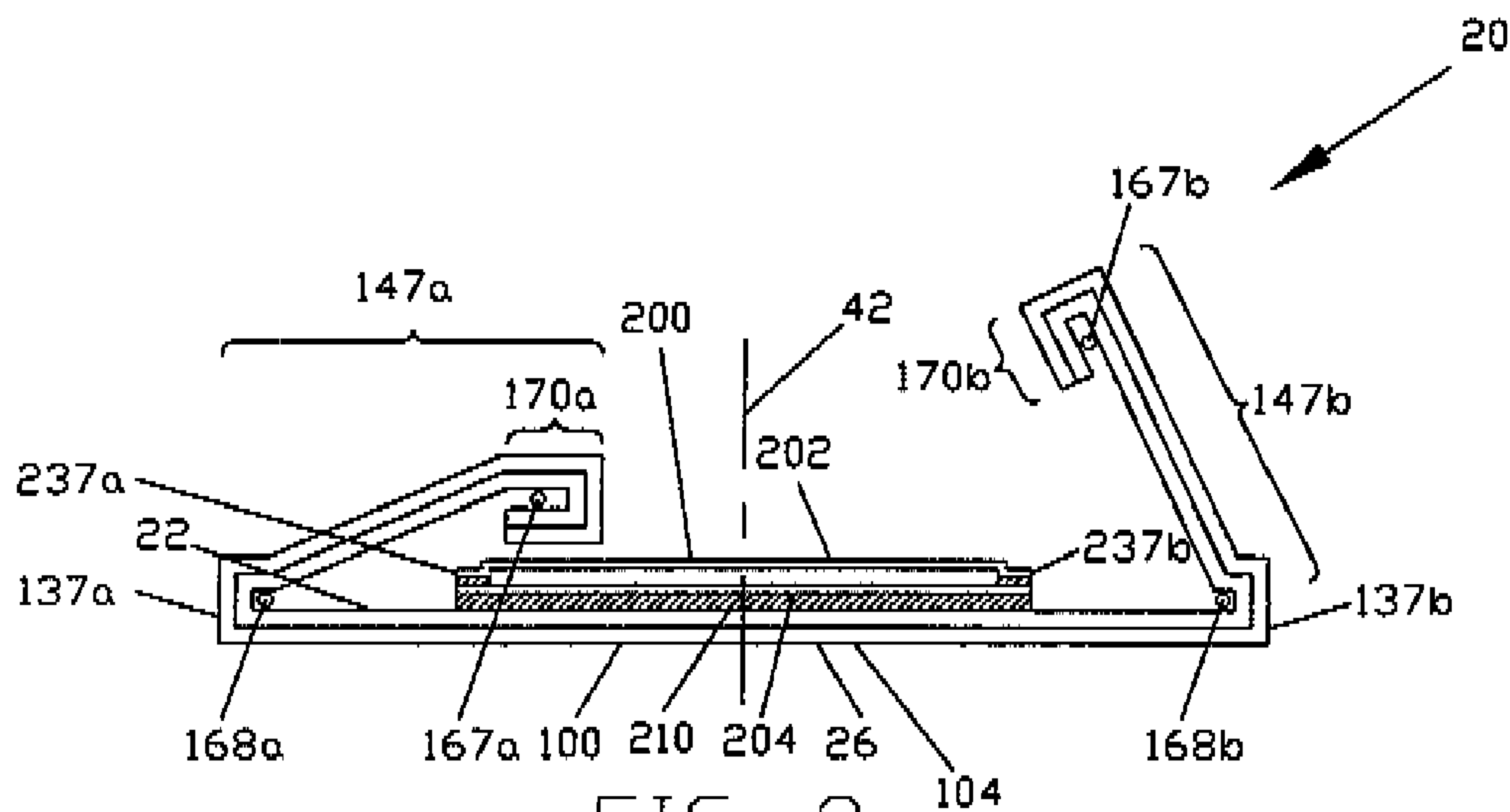


FIG. 8

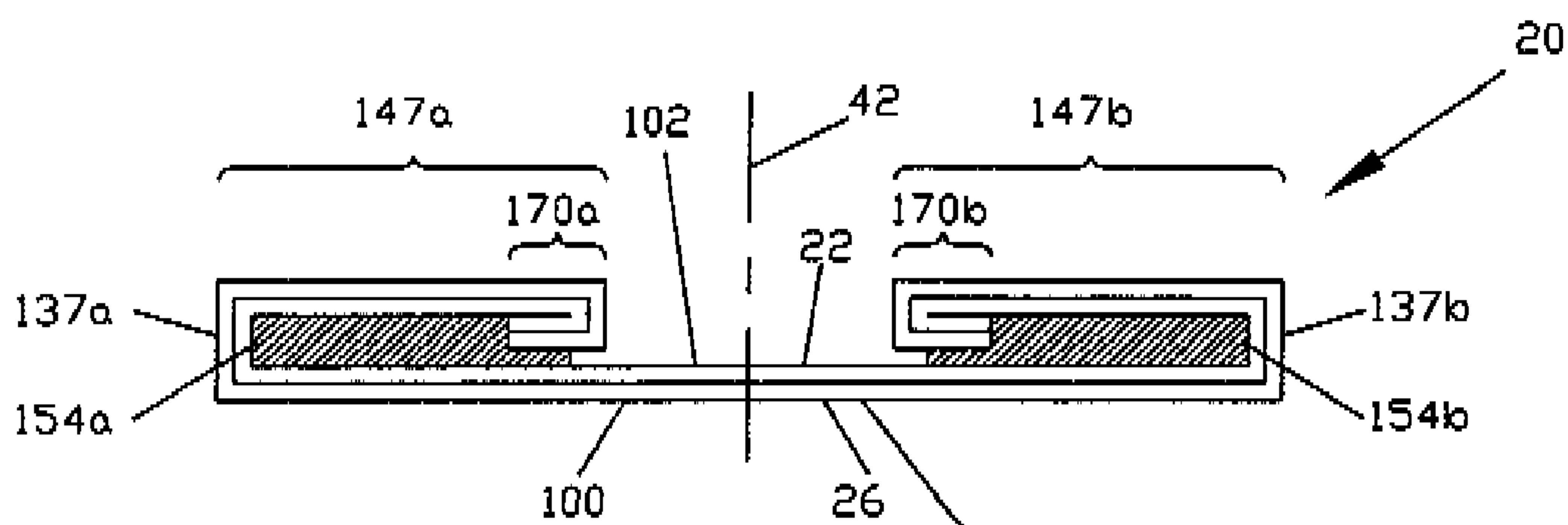


FIG. 9

7/16

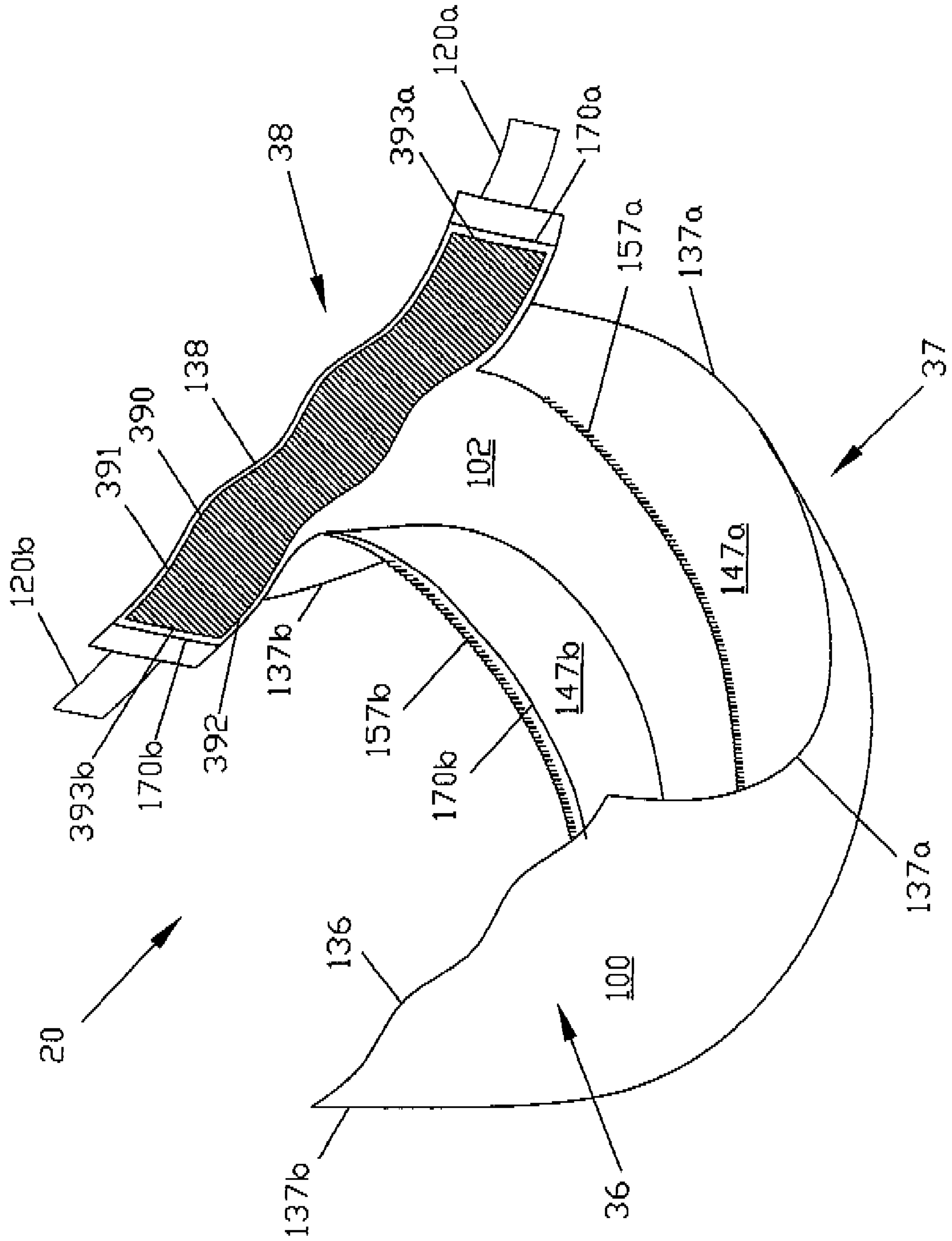


FIG. 10

8/16

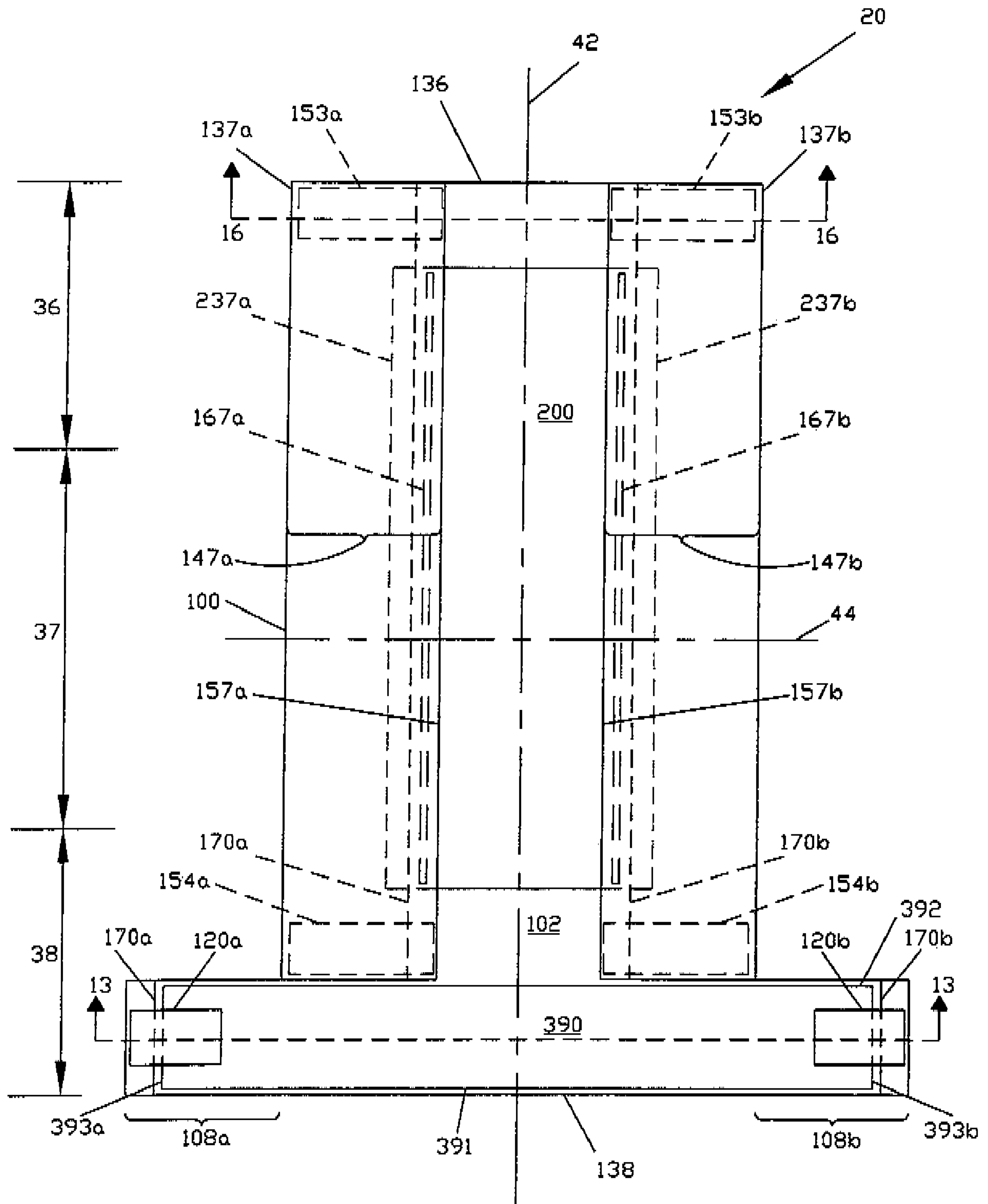


FIG. 11

9/16

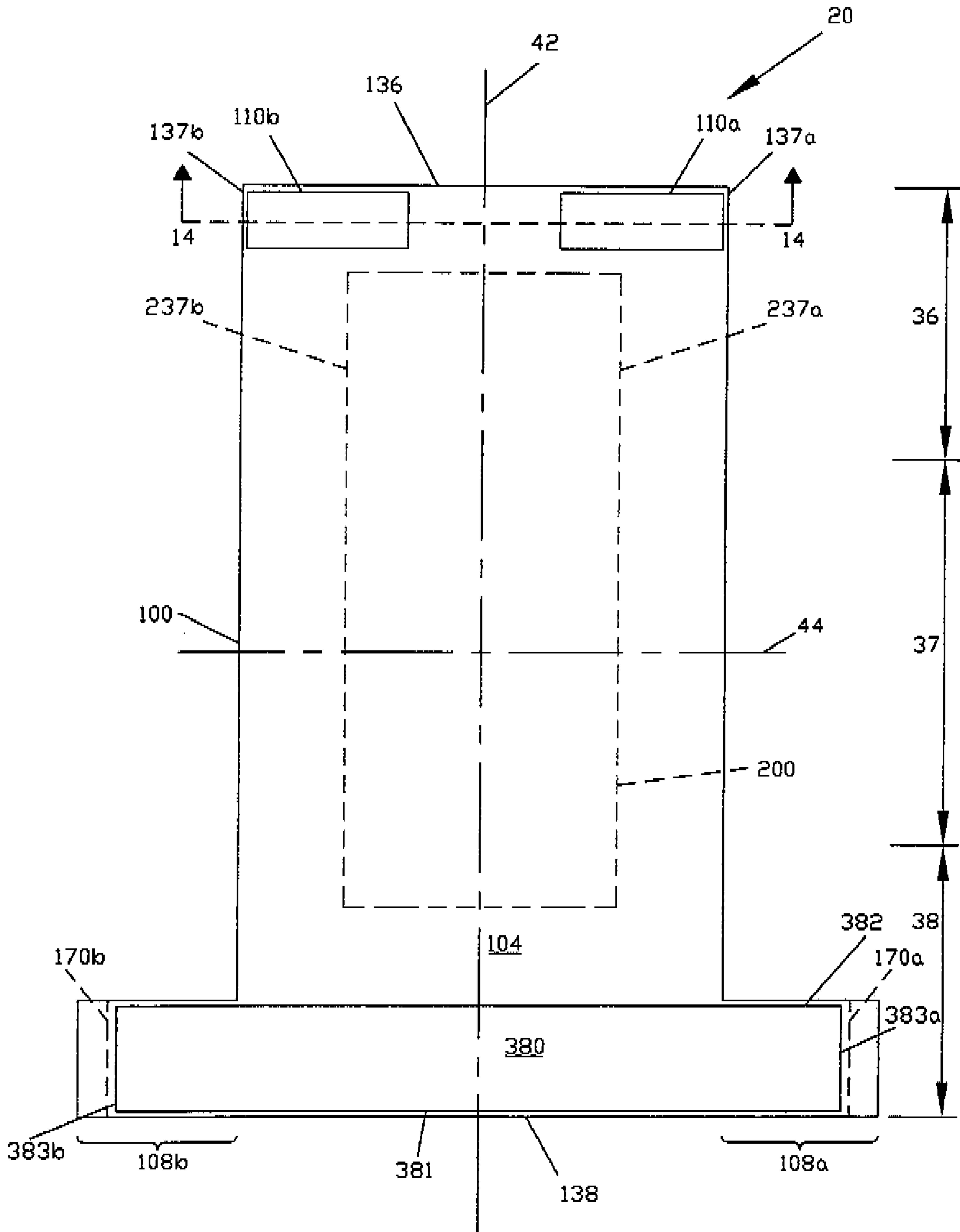


FIG. 12

10/16

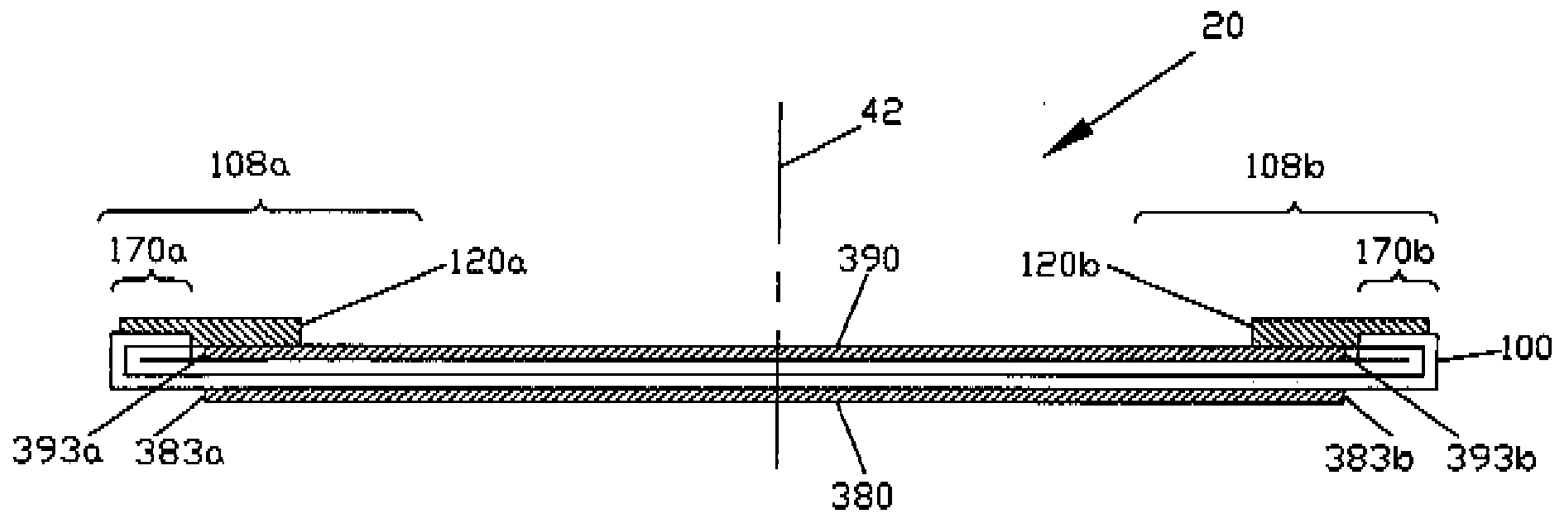


FIG. 13

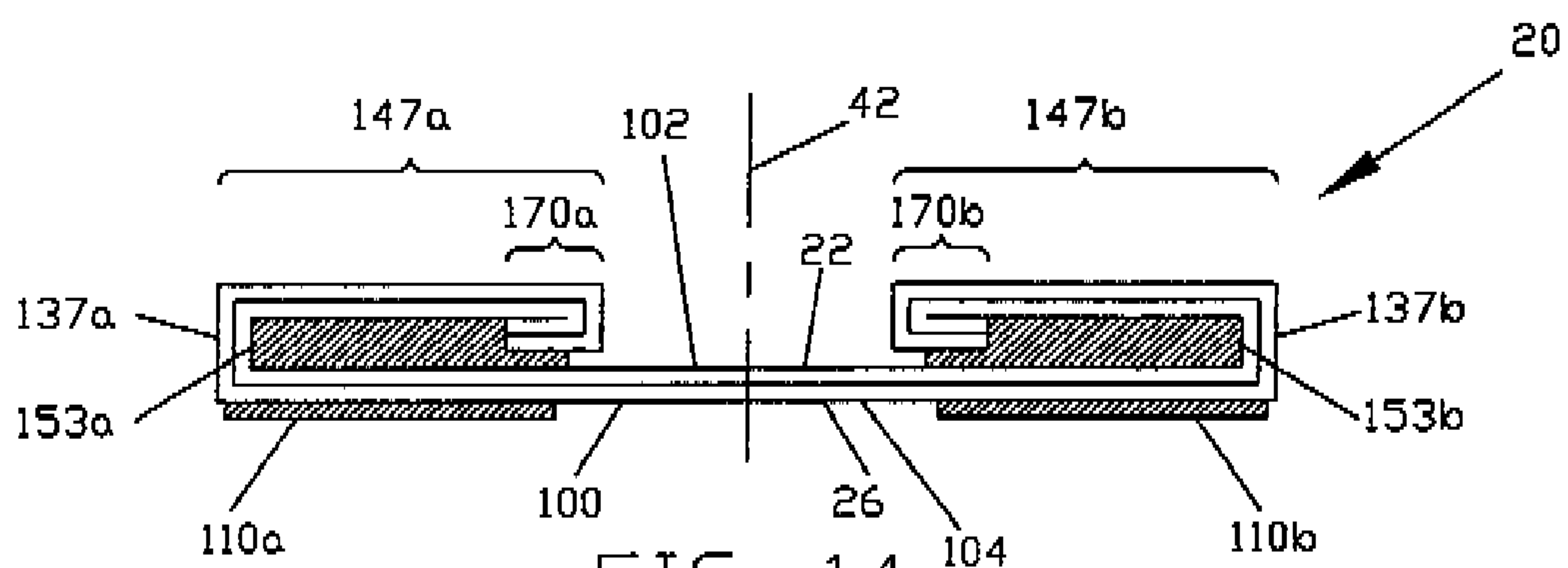


FIG. 14

11/16

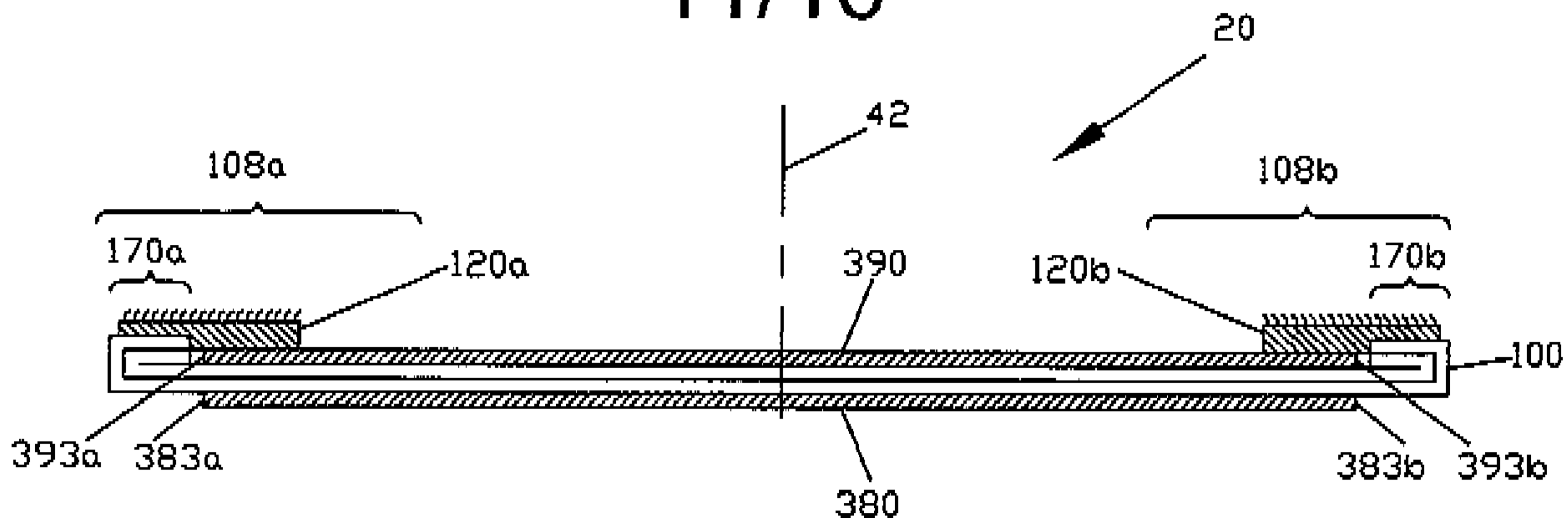


FIG. 15

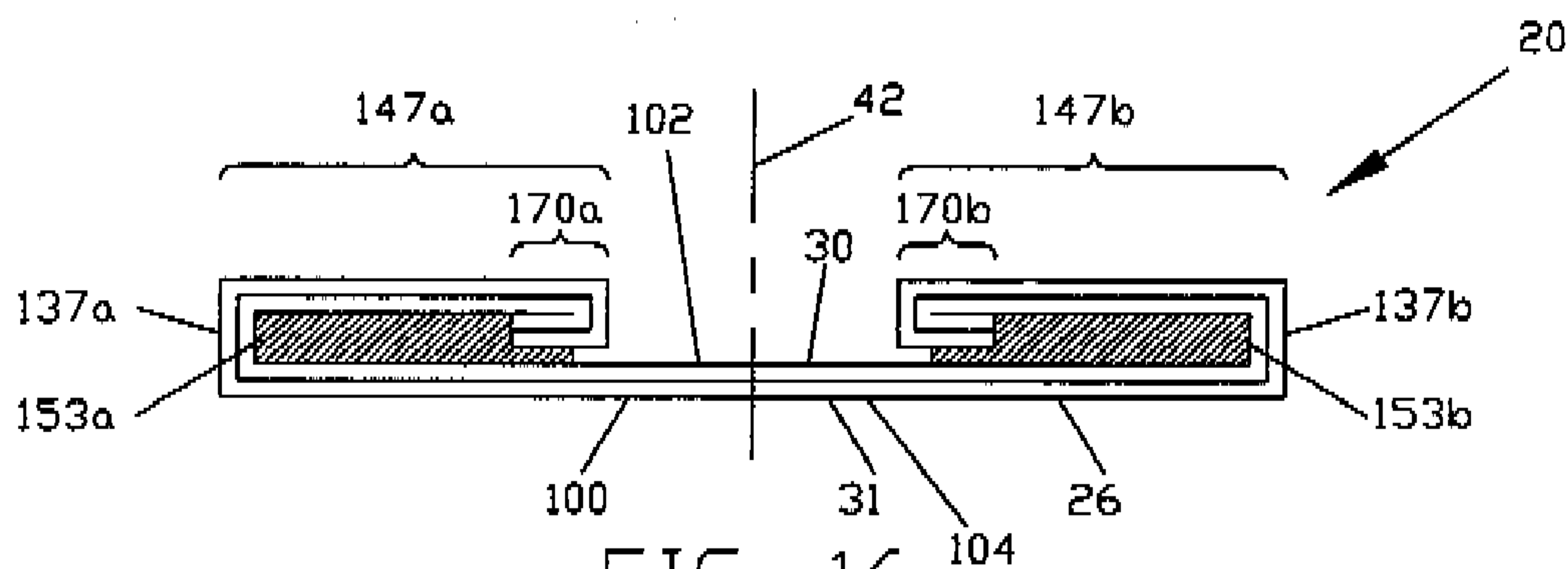


FIG. 16

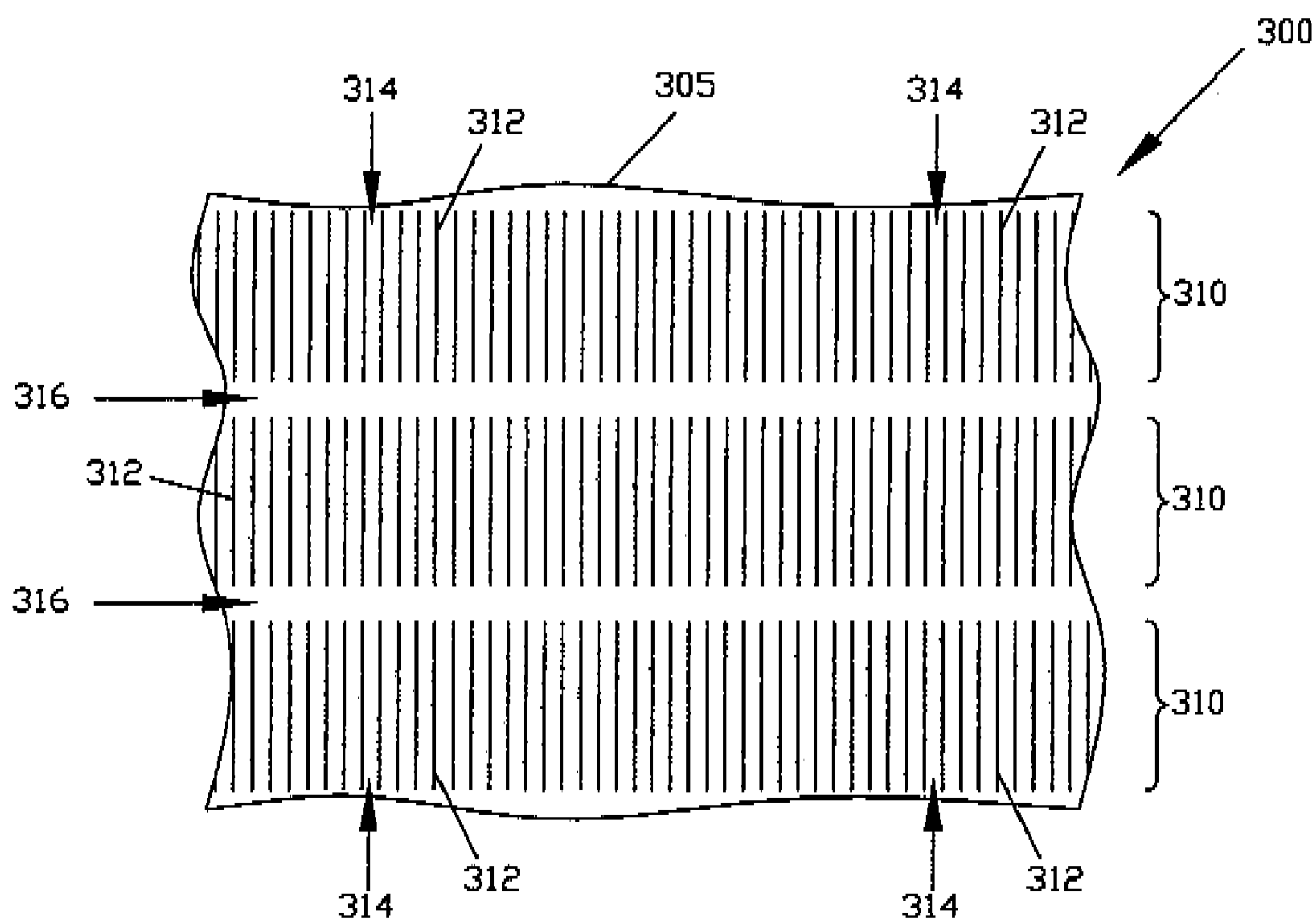


FIG. 17

12/16

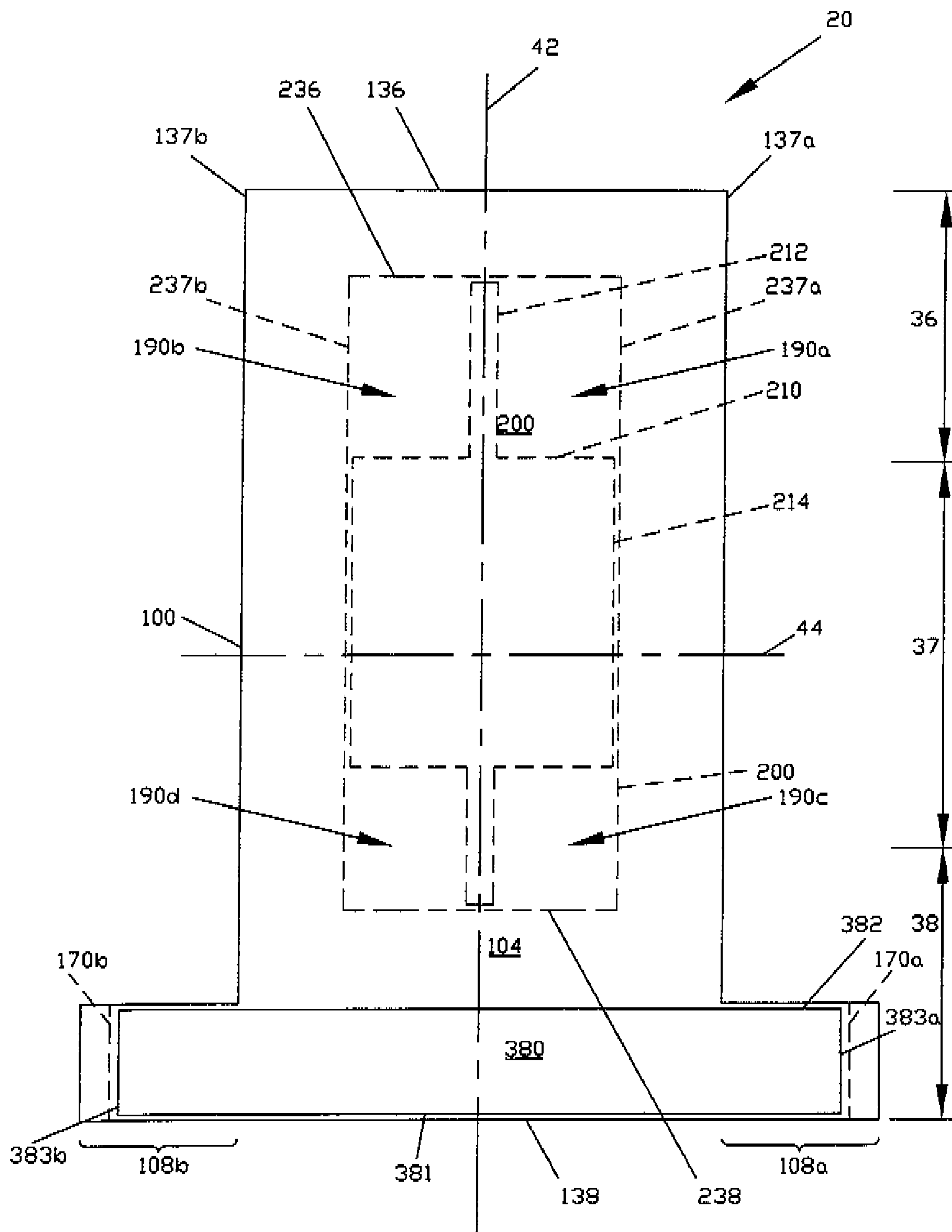


FIG. 18

13/16

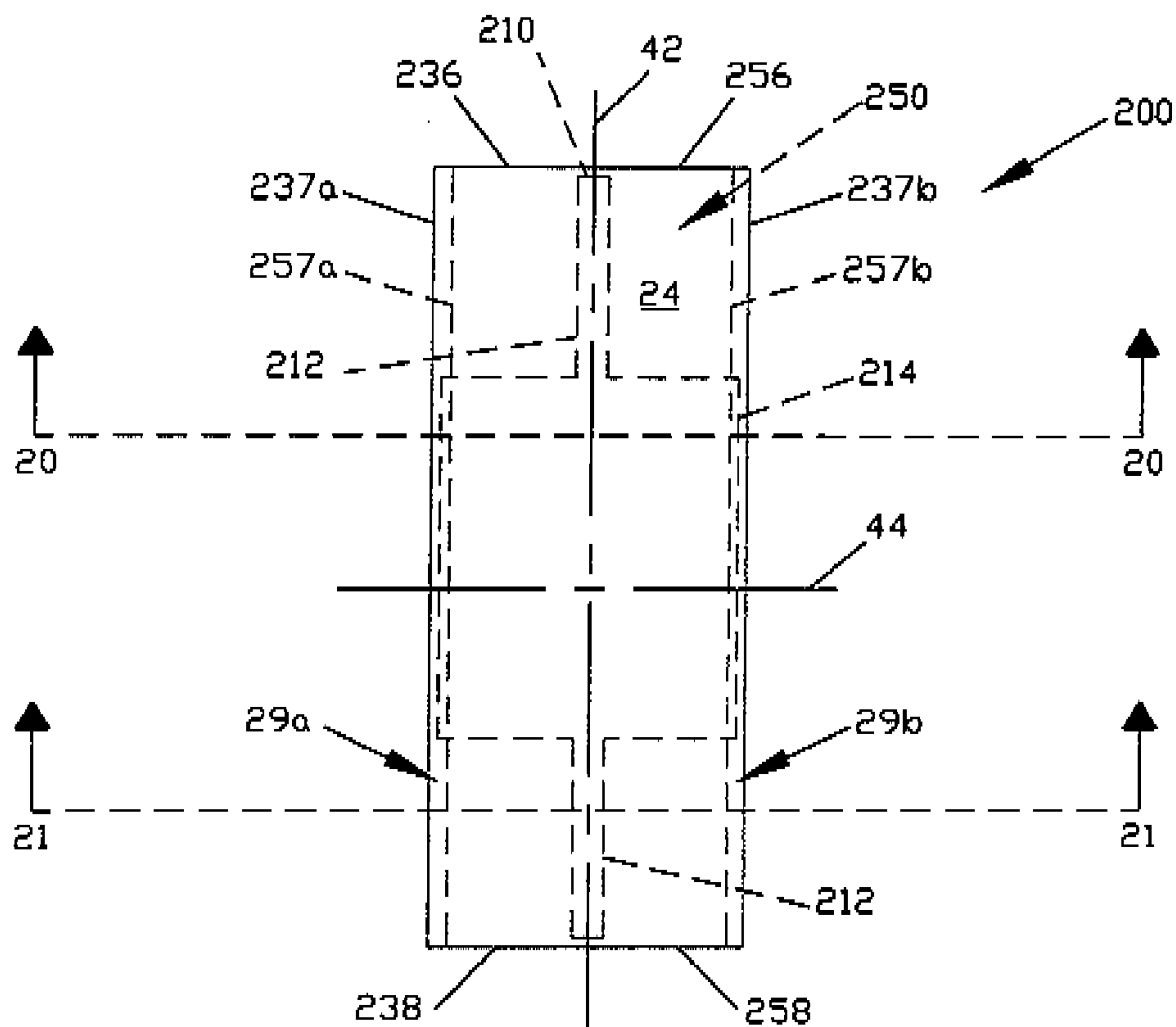


FIG. 19

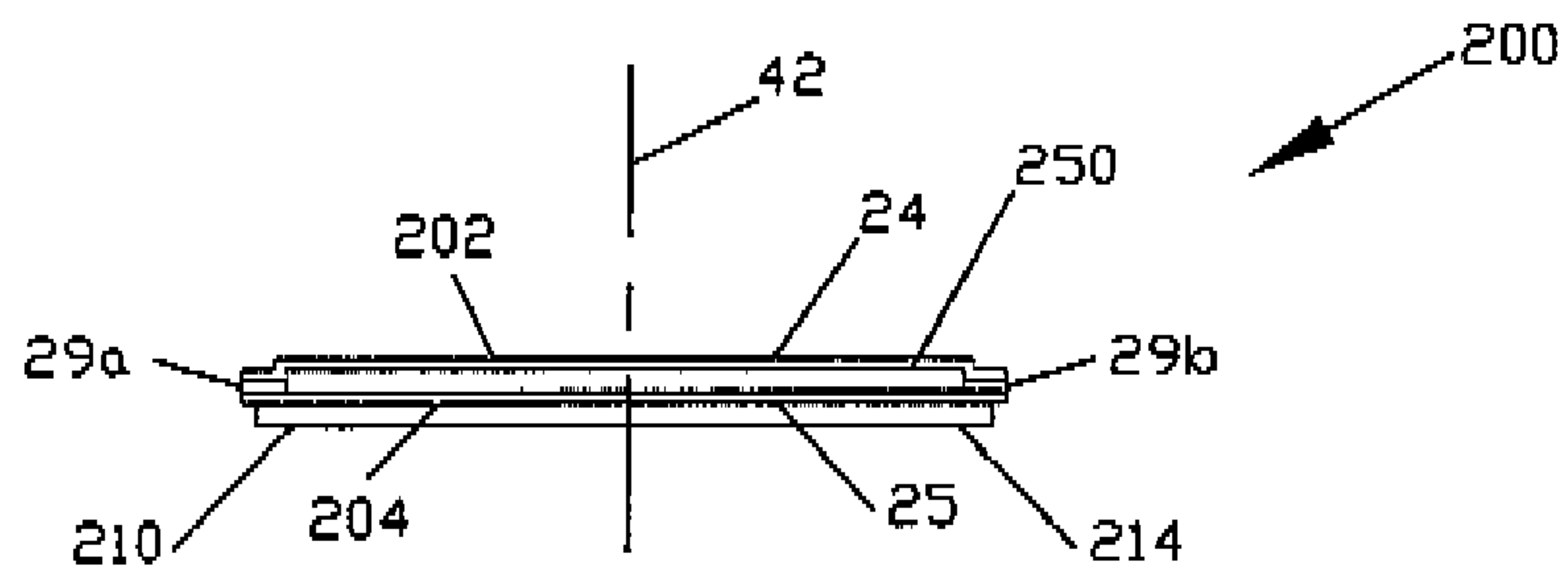


FIG. 20

14/16

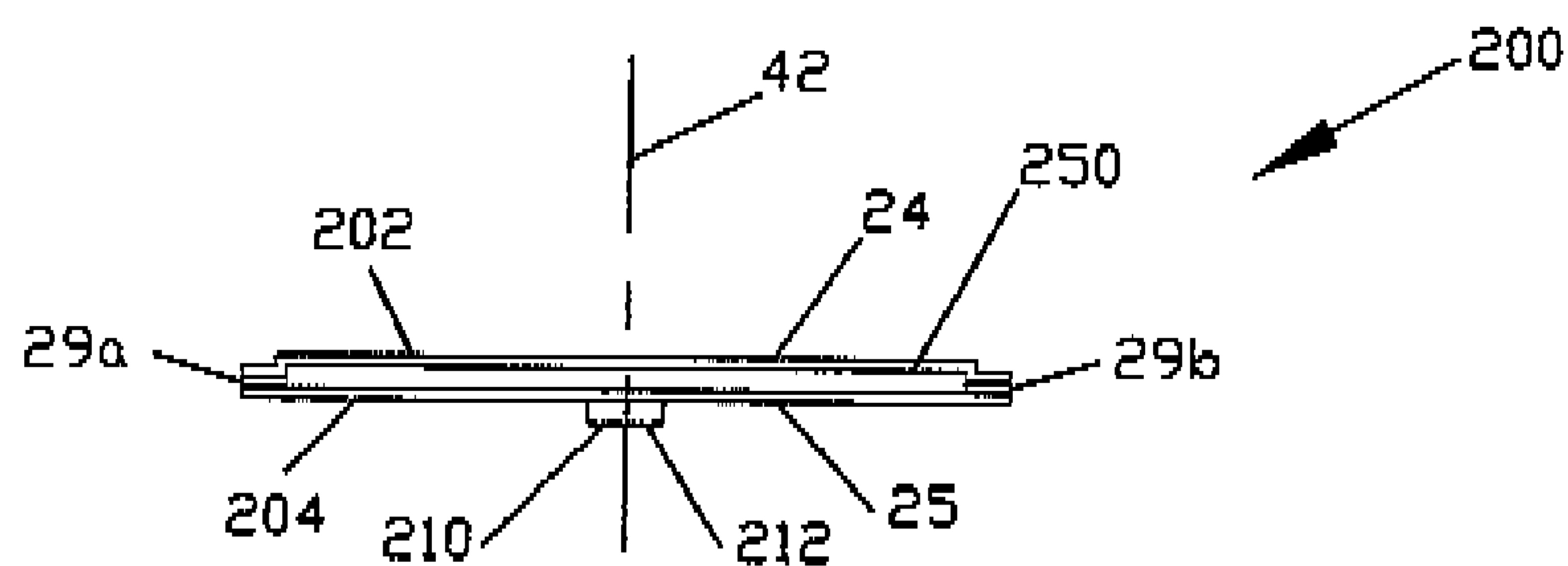


FIG. 21

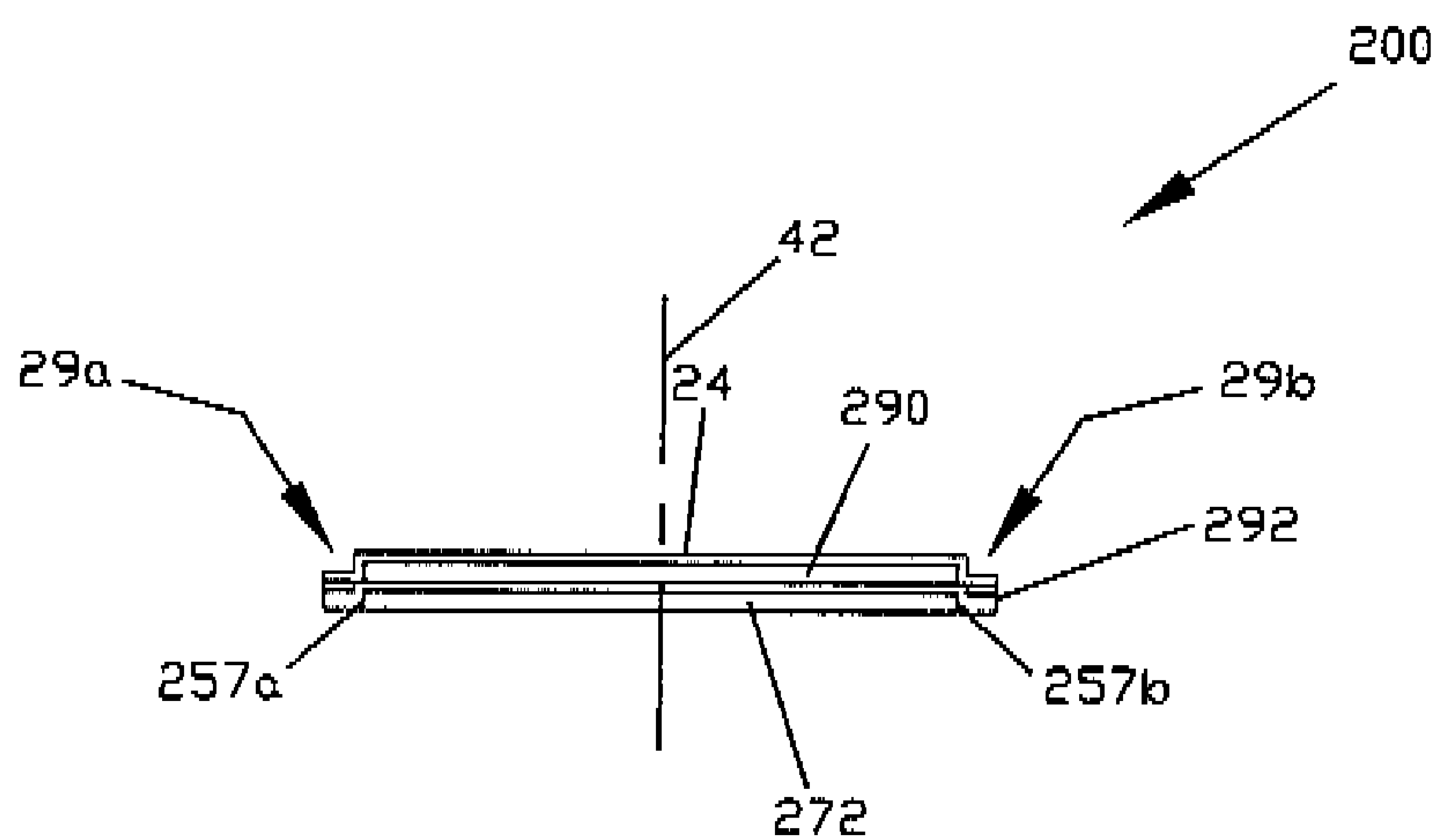


FIG. 22

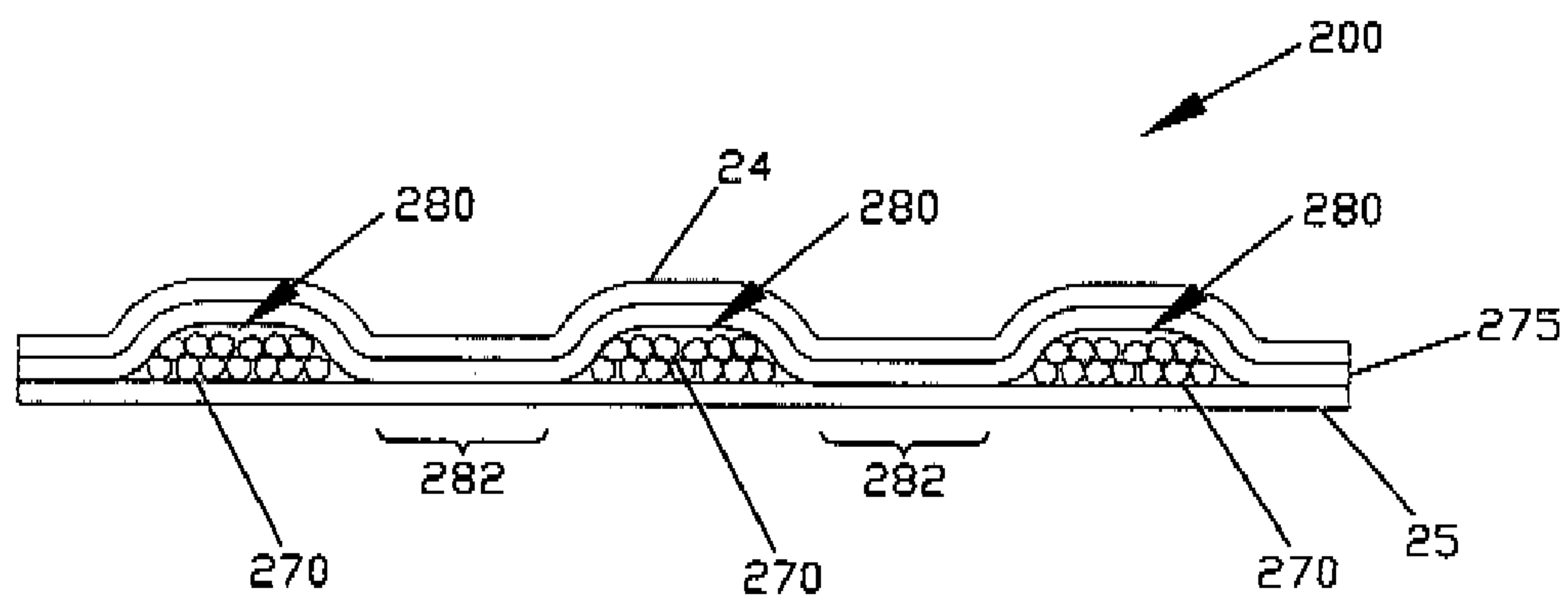


FIG. 23

15/16

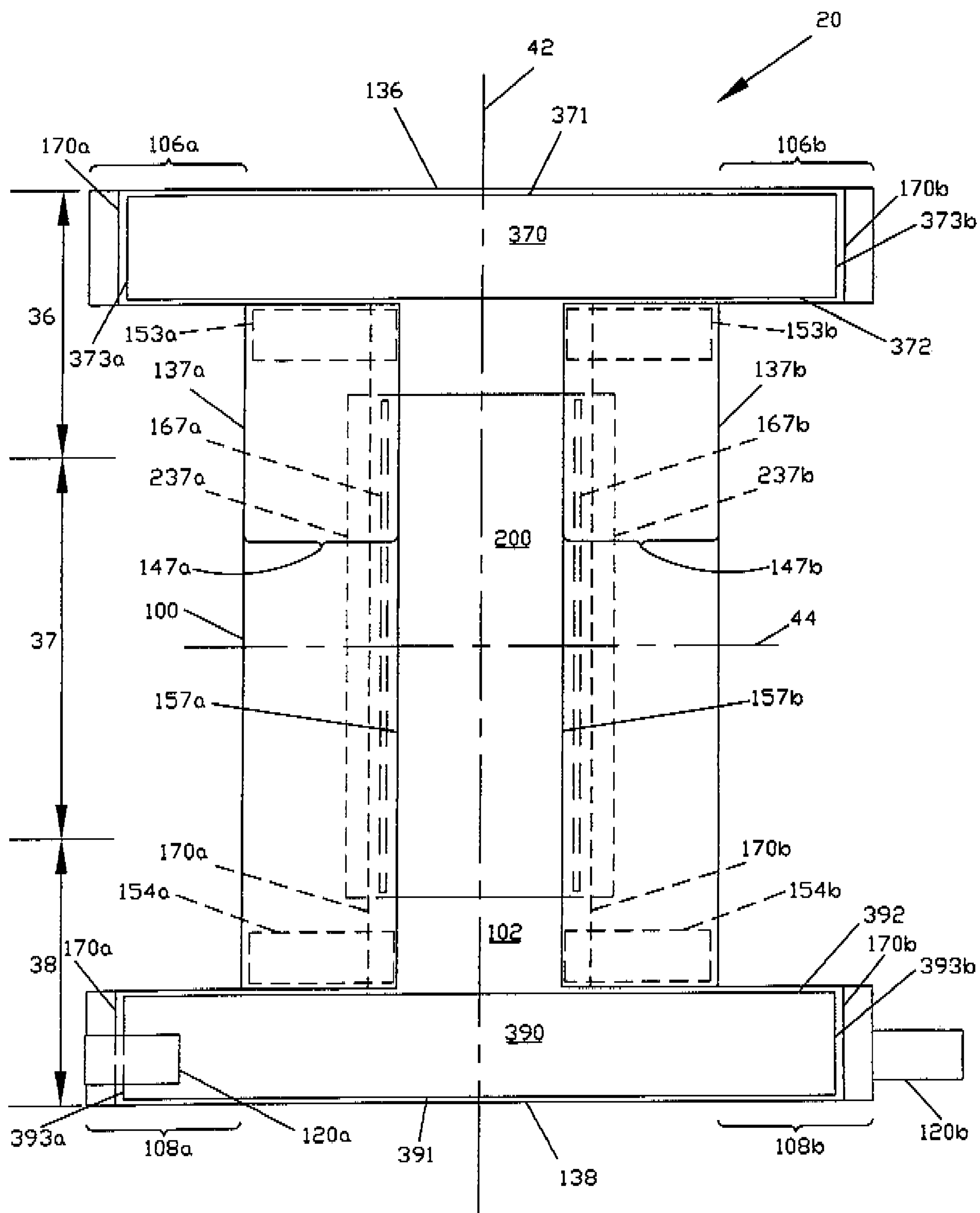


FIG. 24

16/16

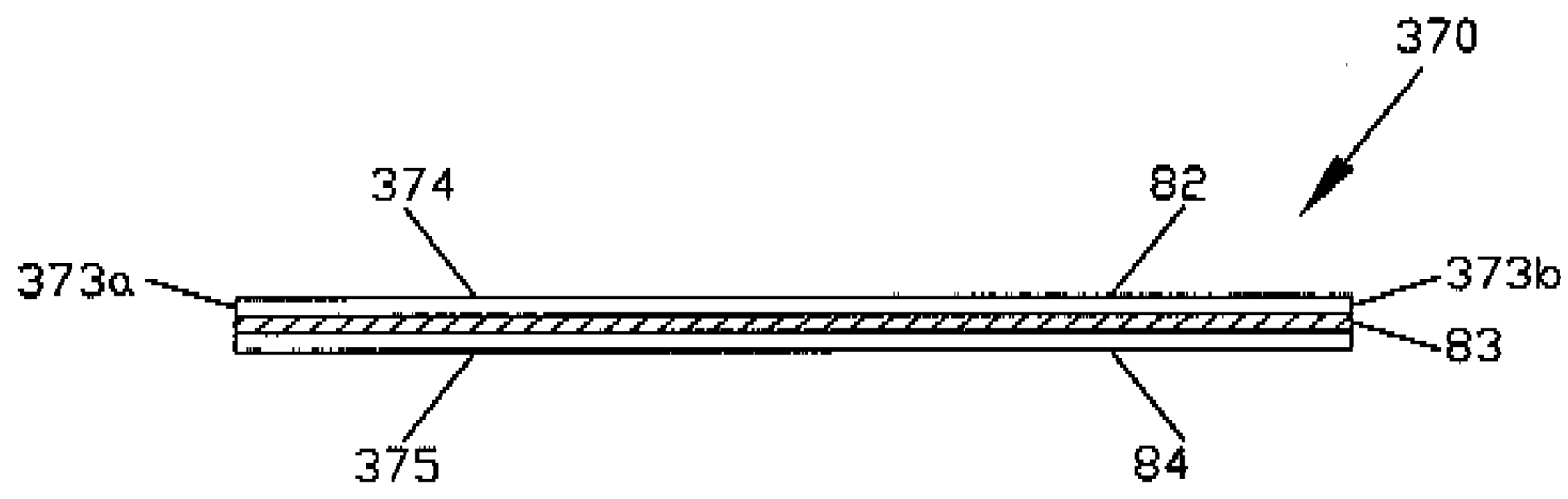


FIG. 25

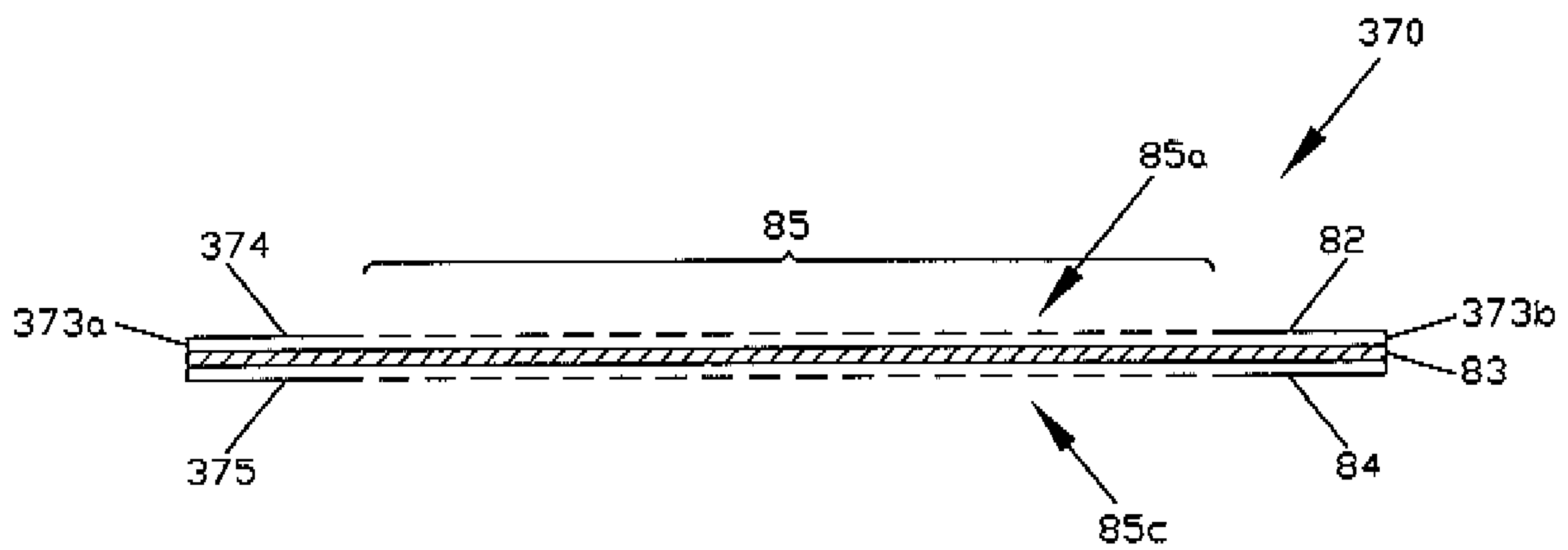


FIG. 26

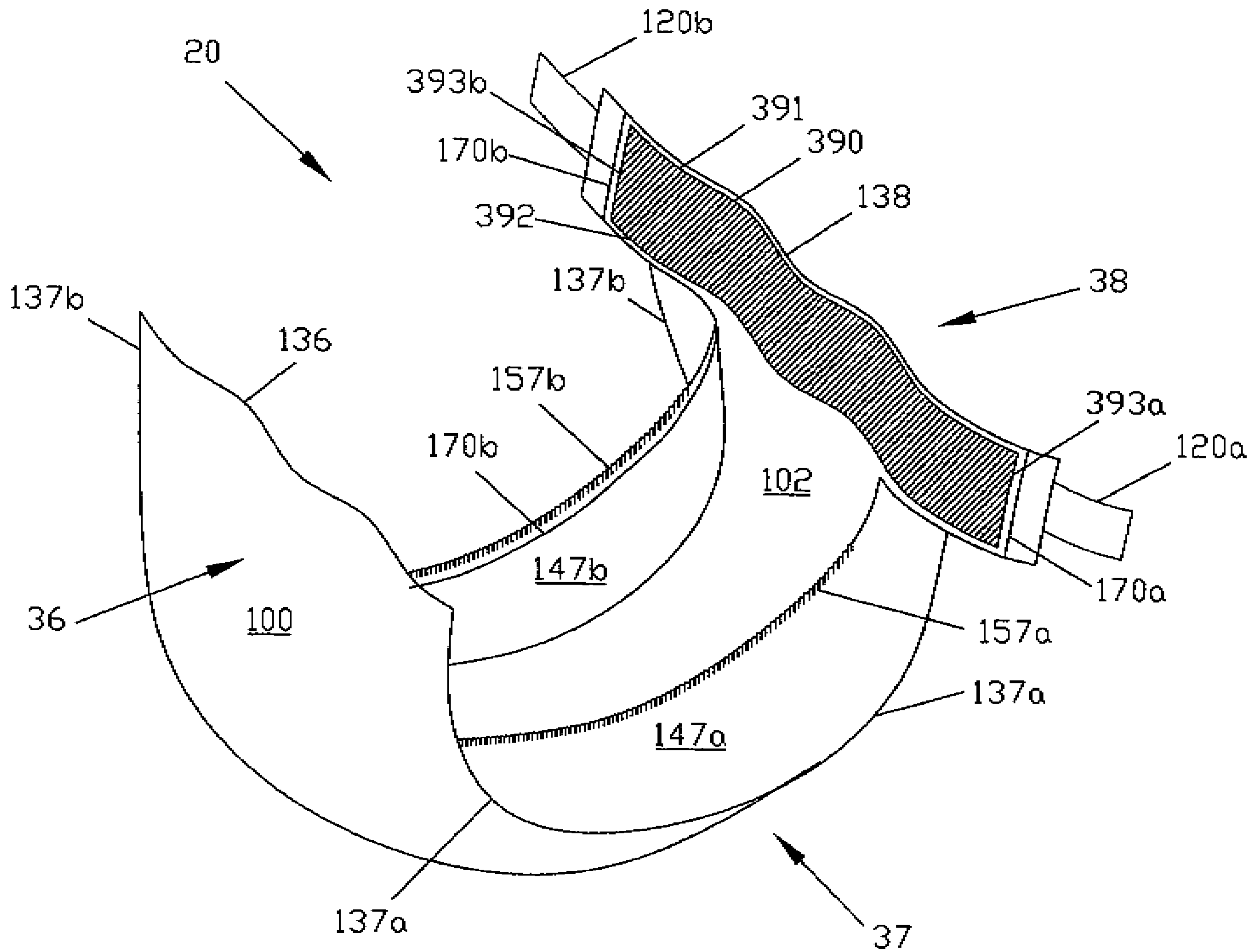


FIG. 10