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Coresh

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(54) **RAZOR CARTRIDGE WITH REDUCED PART COUNT AND EXPANDED RANGE OF MOTION**

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(51) **Int. Cl.**

B26B 21/22	(2006.01)
B26B 21/40	(2006.01)
B26B 21/44	(2006.01)

(52) **U.S. Cl.**

CPC ***B26B 21/225*** (2013.01); ***B26B 21/4068*** (2013.01); ***B26B 21/443*** (2013.01); *B26B 21/22* (2013.01)

(58) **Field of Classification Search**

CPC ... B26B 21/225; B26B 21/22; B26B 21/4012; B26B 21/4037; B26B 21/4068; B26B 21/443

See application file for complete search history.

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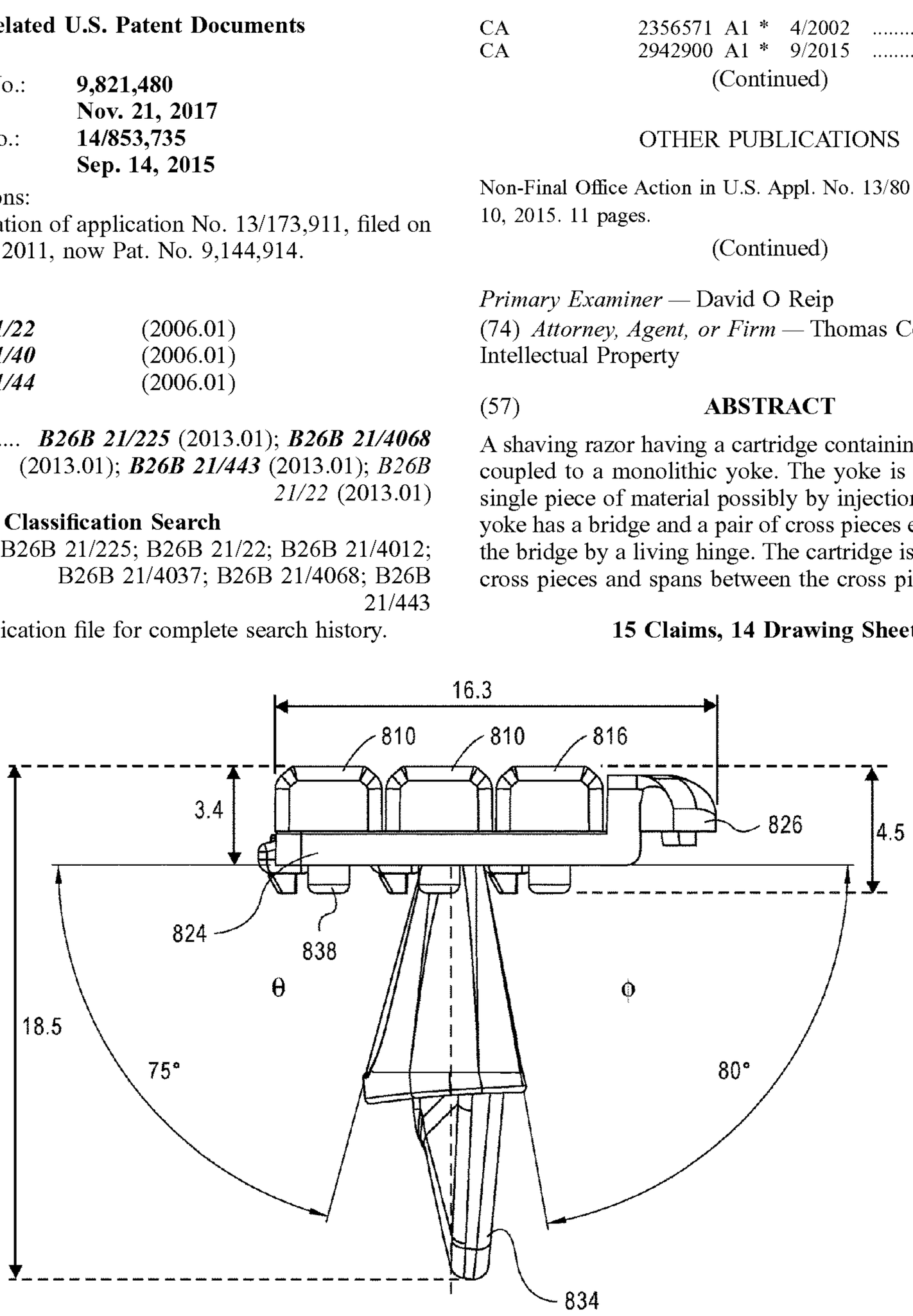
Primary Examiner — David O Reip

(74) *Attorney, Agent, or Firm* — Thomas Coester Intellectual Property

(57) **ABSTRACT**

A shaving razor having a cartridge containing a razor blade coupled to a monolithic yoke. The yoke is formed from a single piece of material possibly by injection molding. The yoke has a bridge and a pair of cross pieces each coupled to the bridge by a living hinge. The cartridge is coupled to the cross pieces and spans between the cross pieces.

15 Claims, 14 Drawing Sheets



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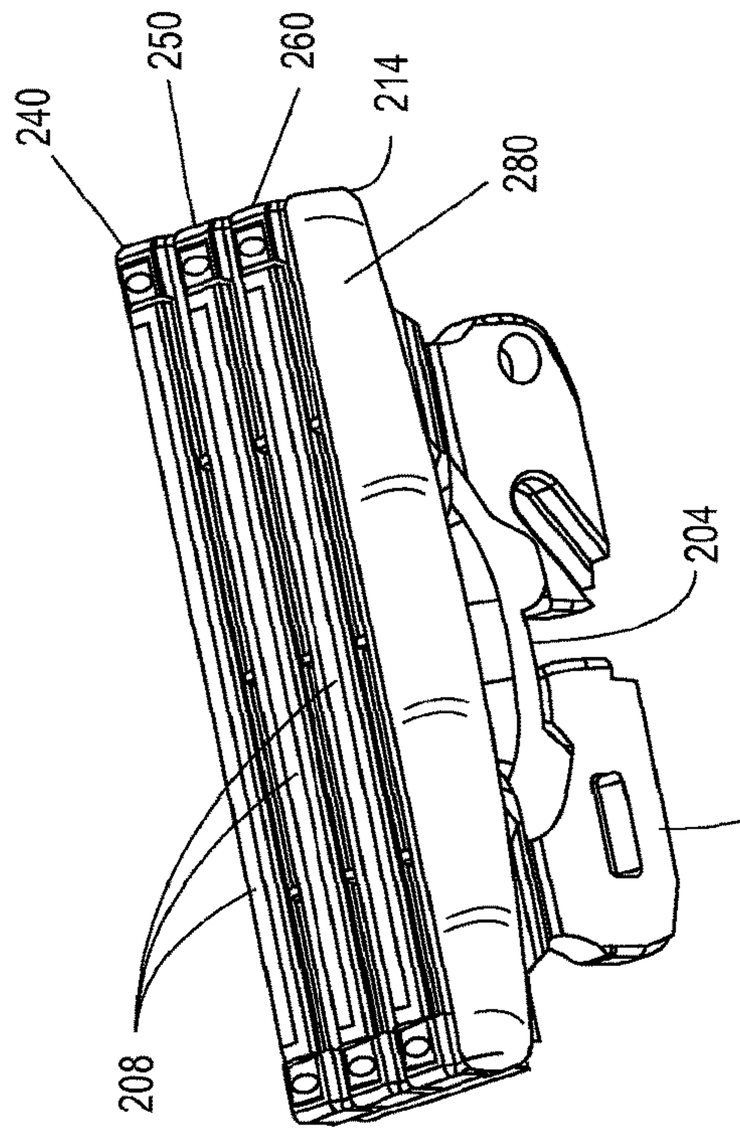
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FIG. 1B

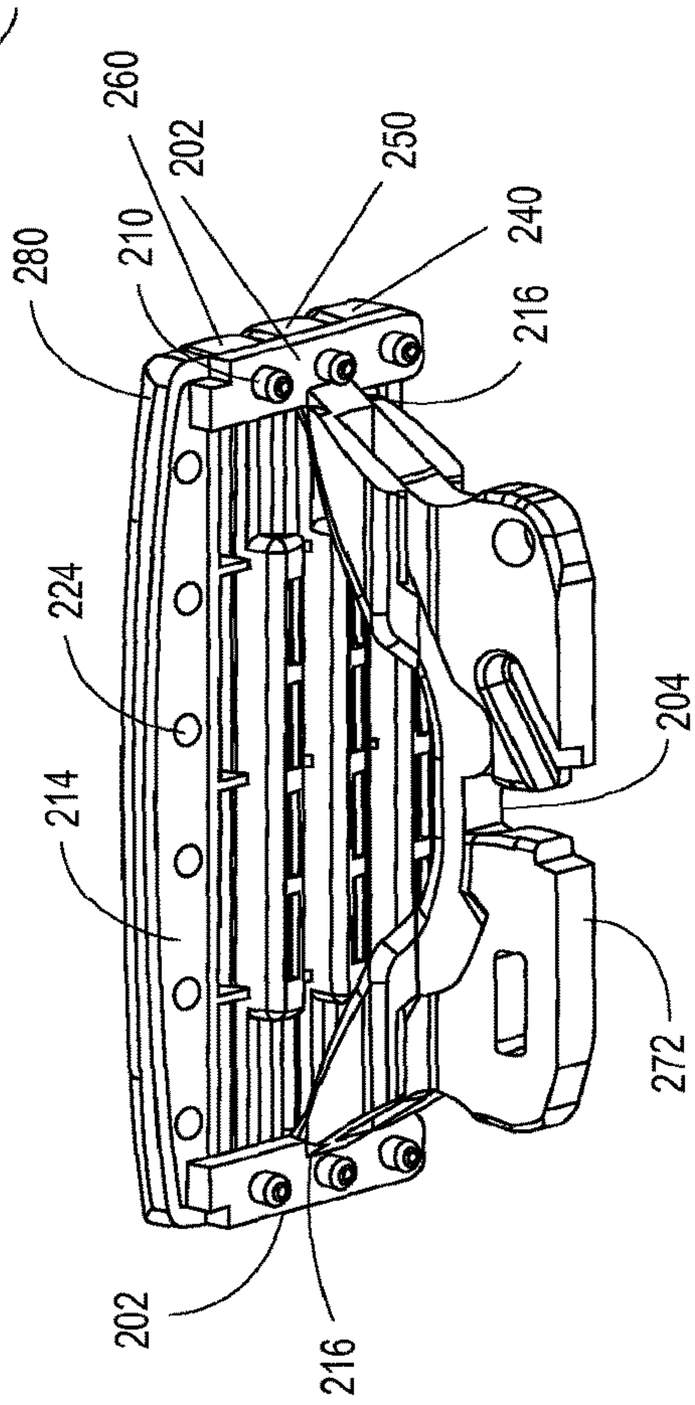
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FIG. 1A

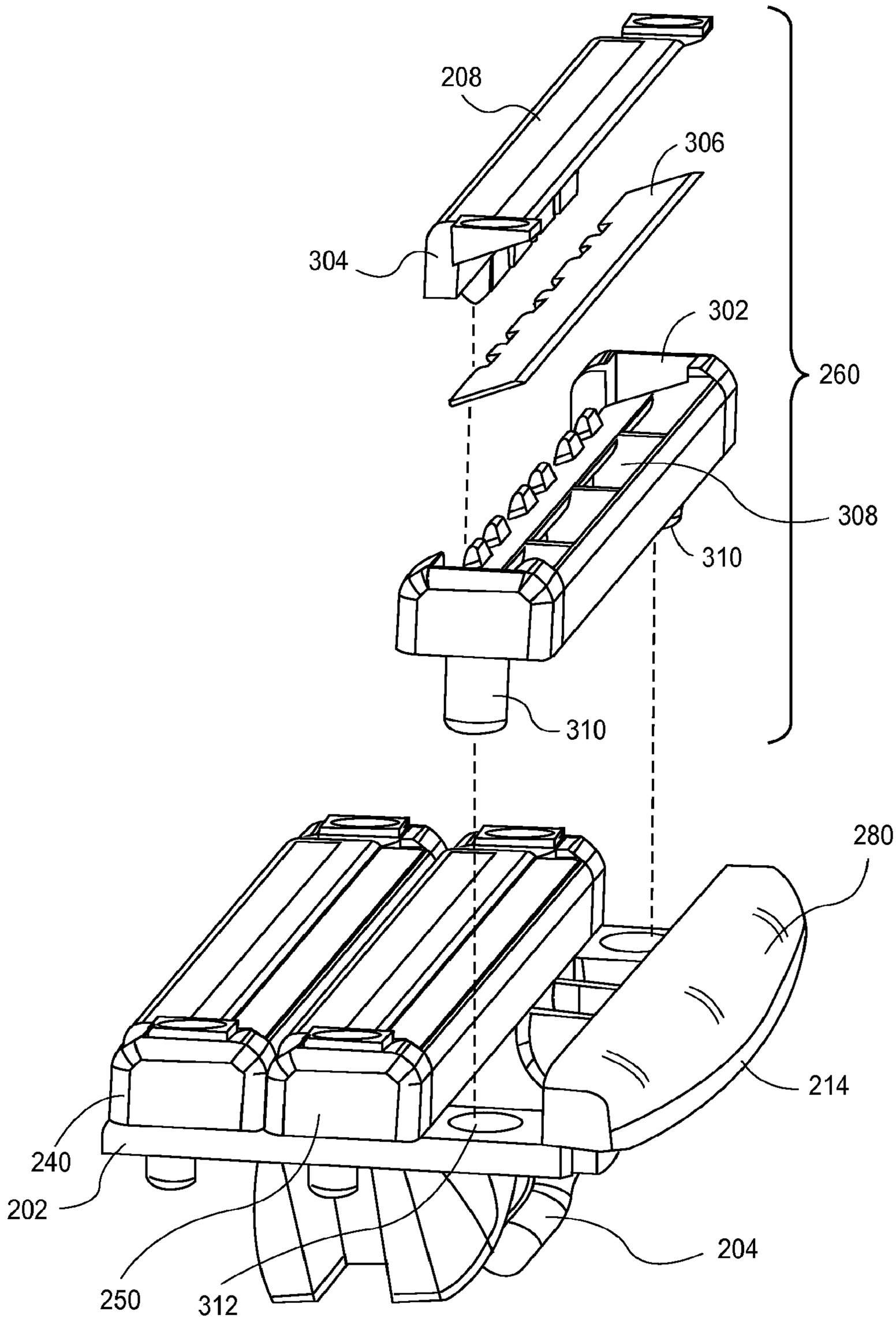


FIG. 2

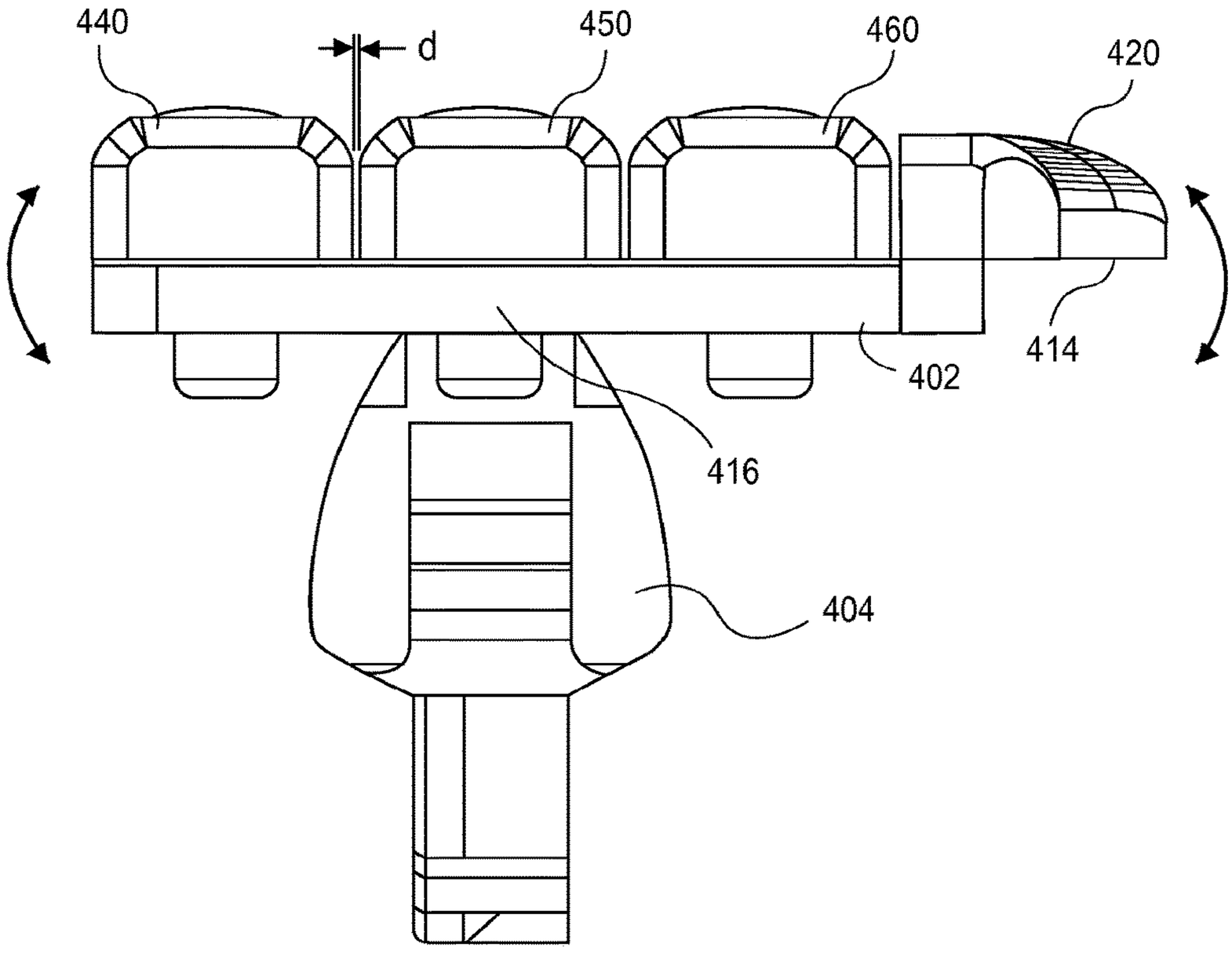
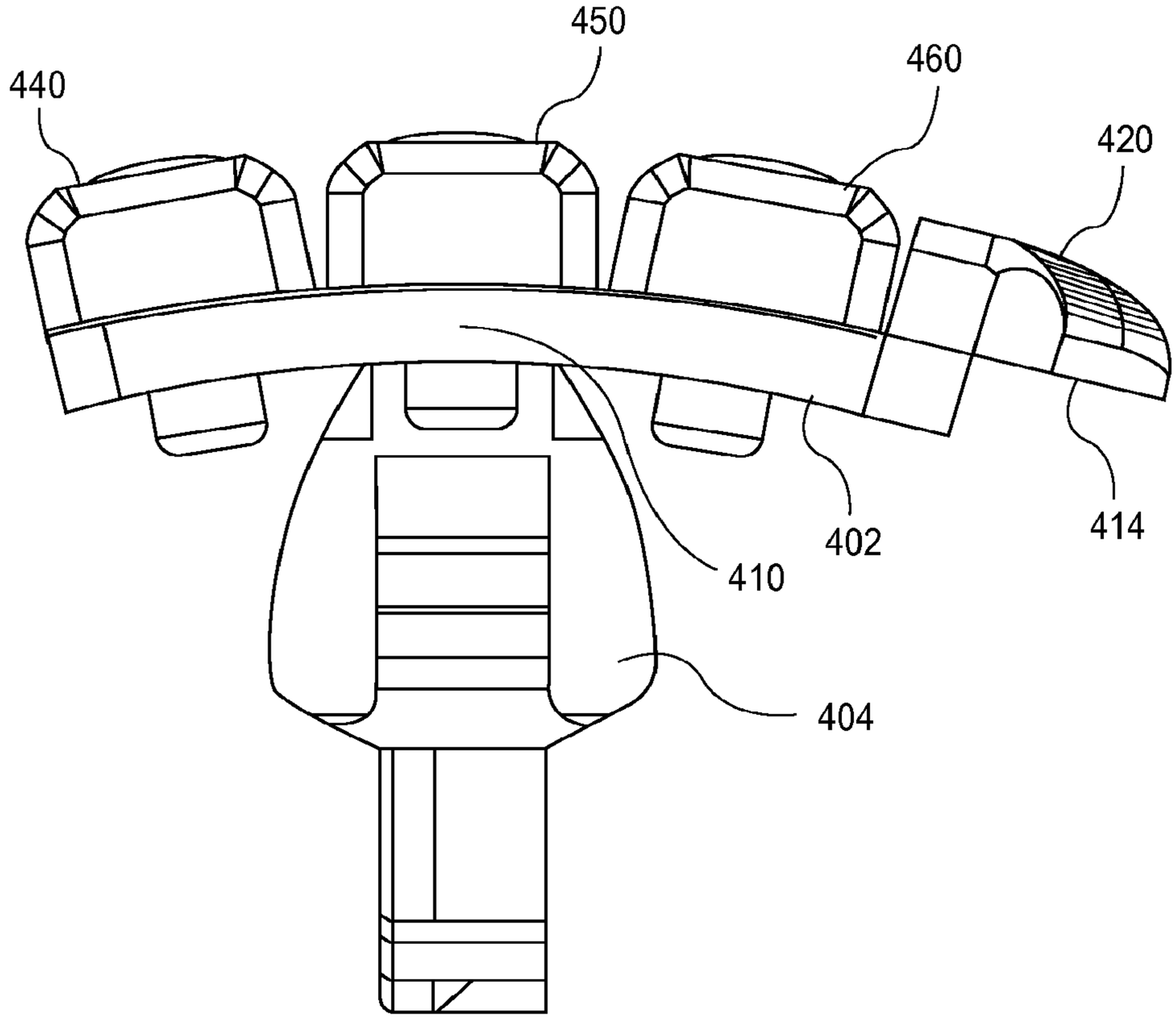


FIG. 3A



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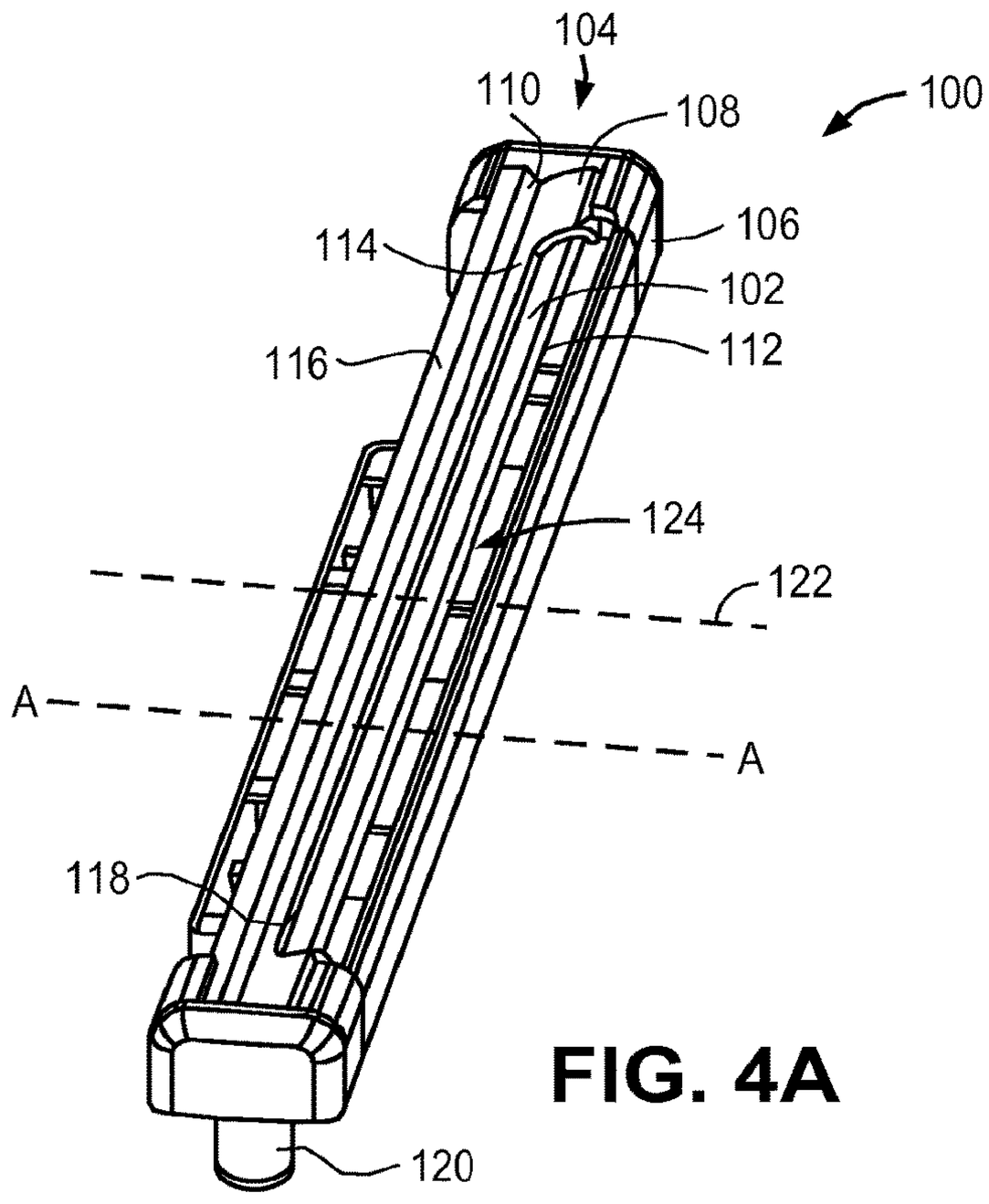
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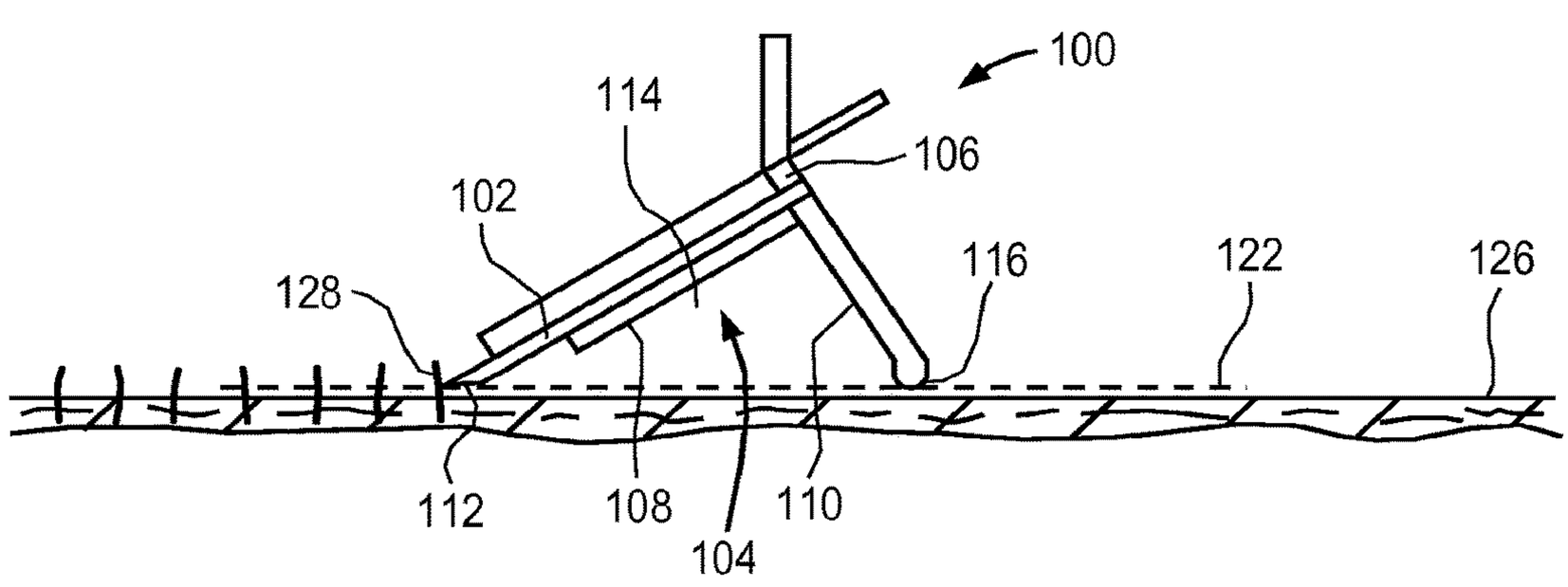
FIG. 4A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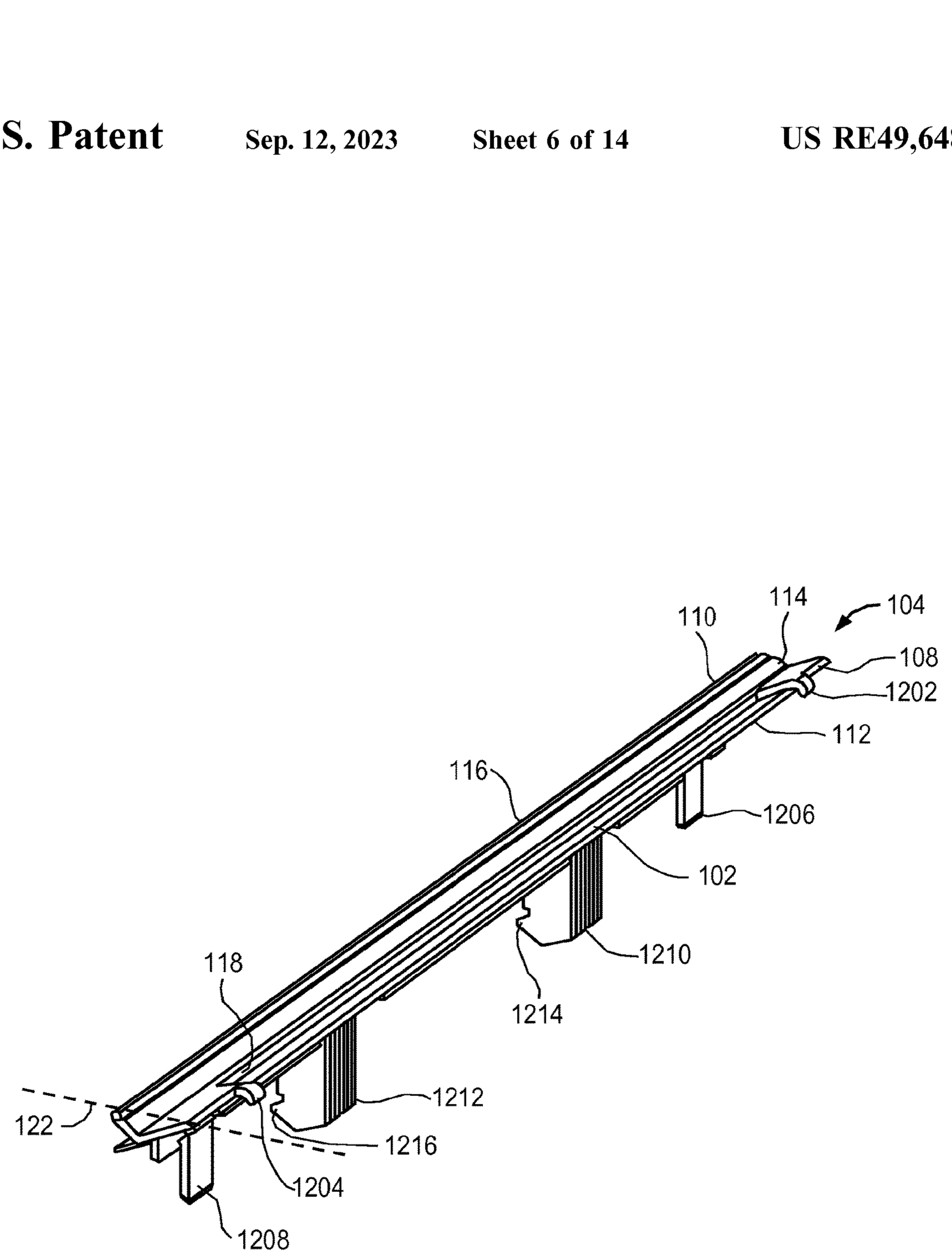
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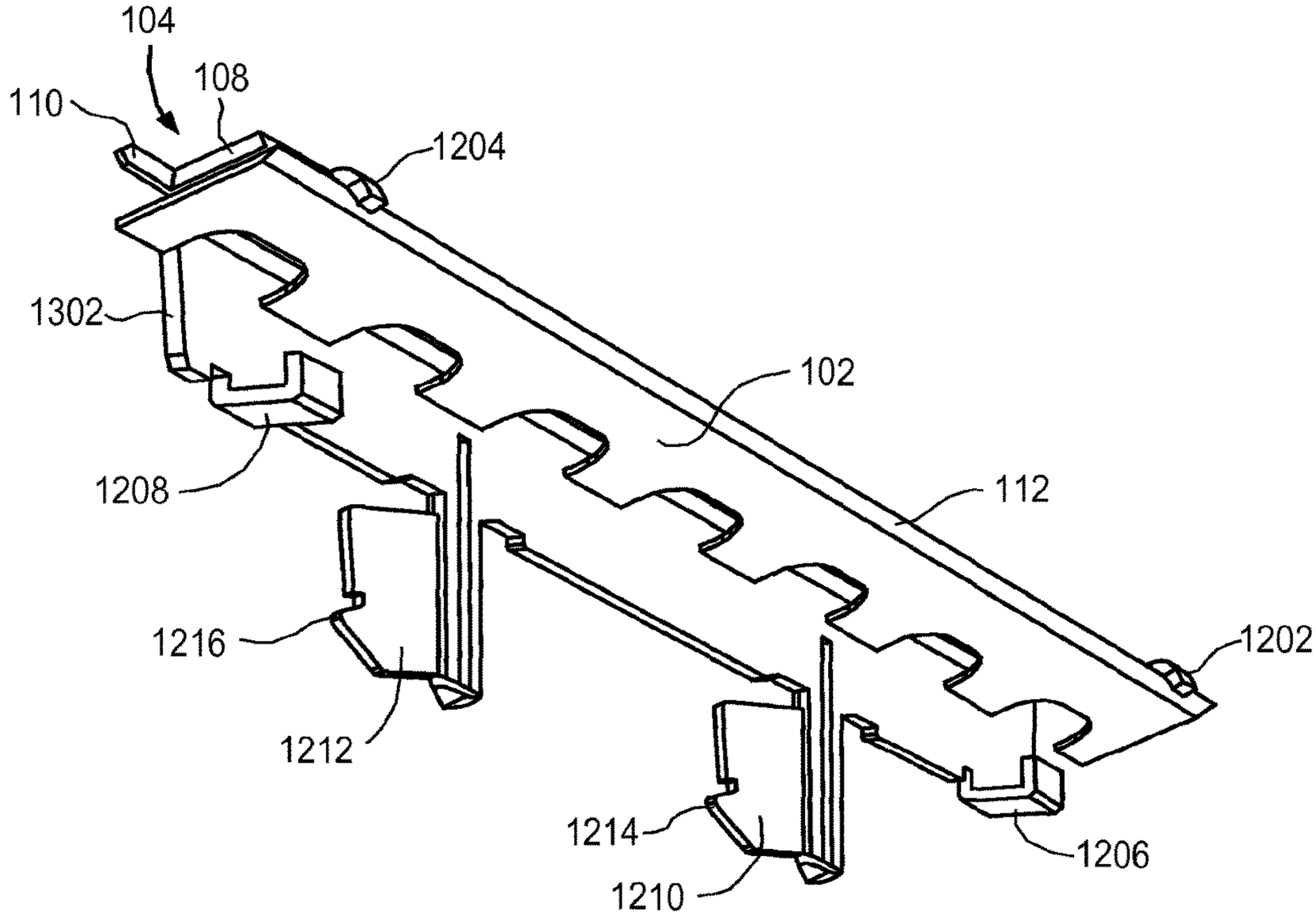
FIG. 5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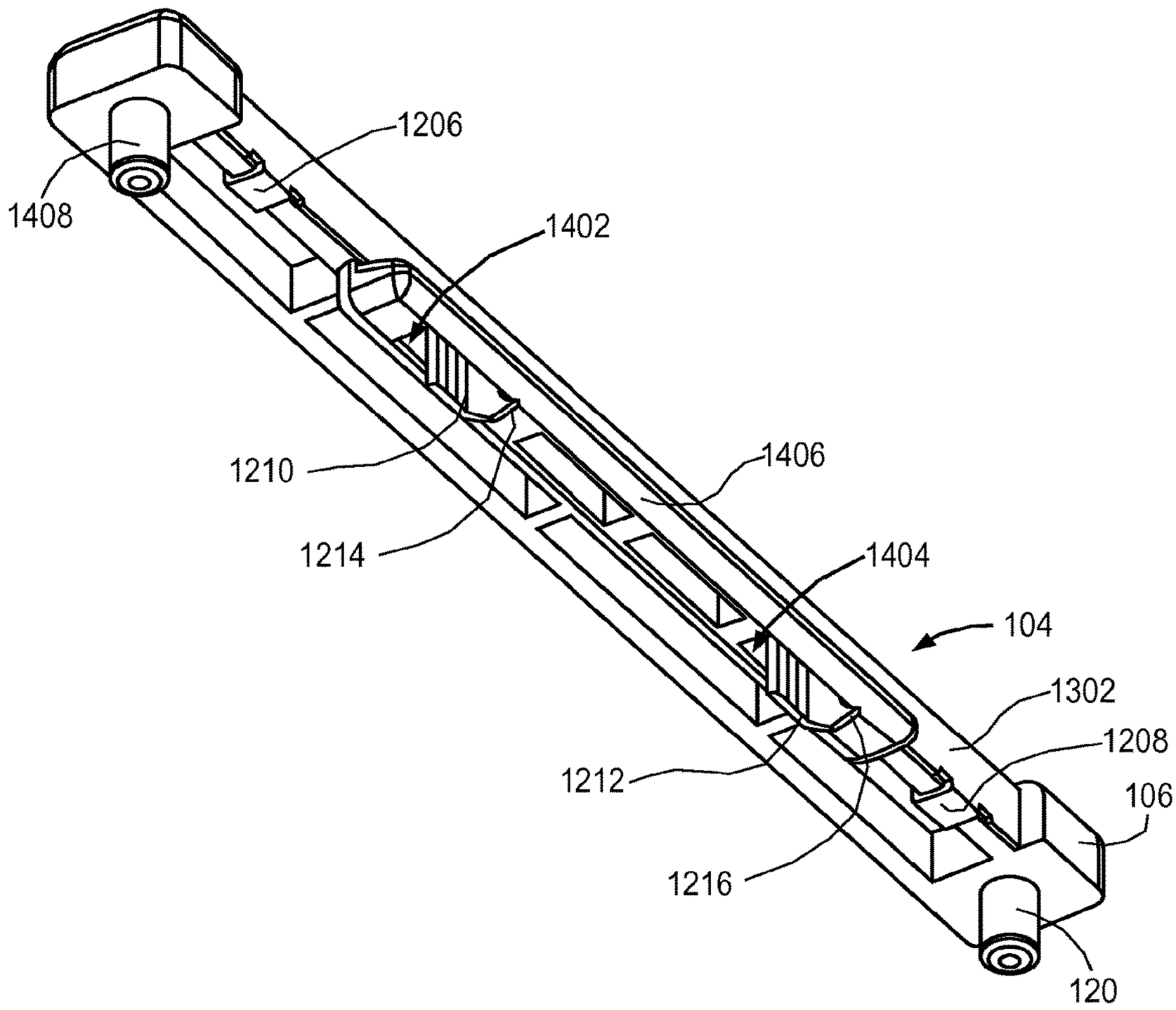
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FIG. 7

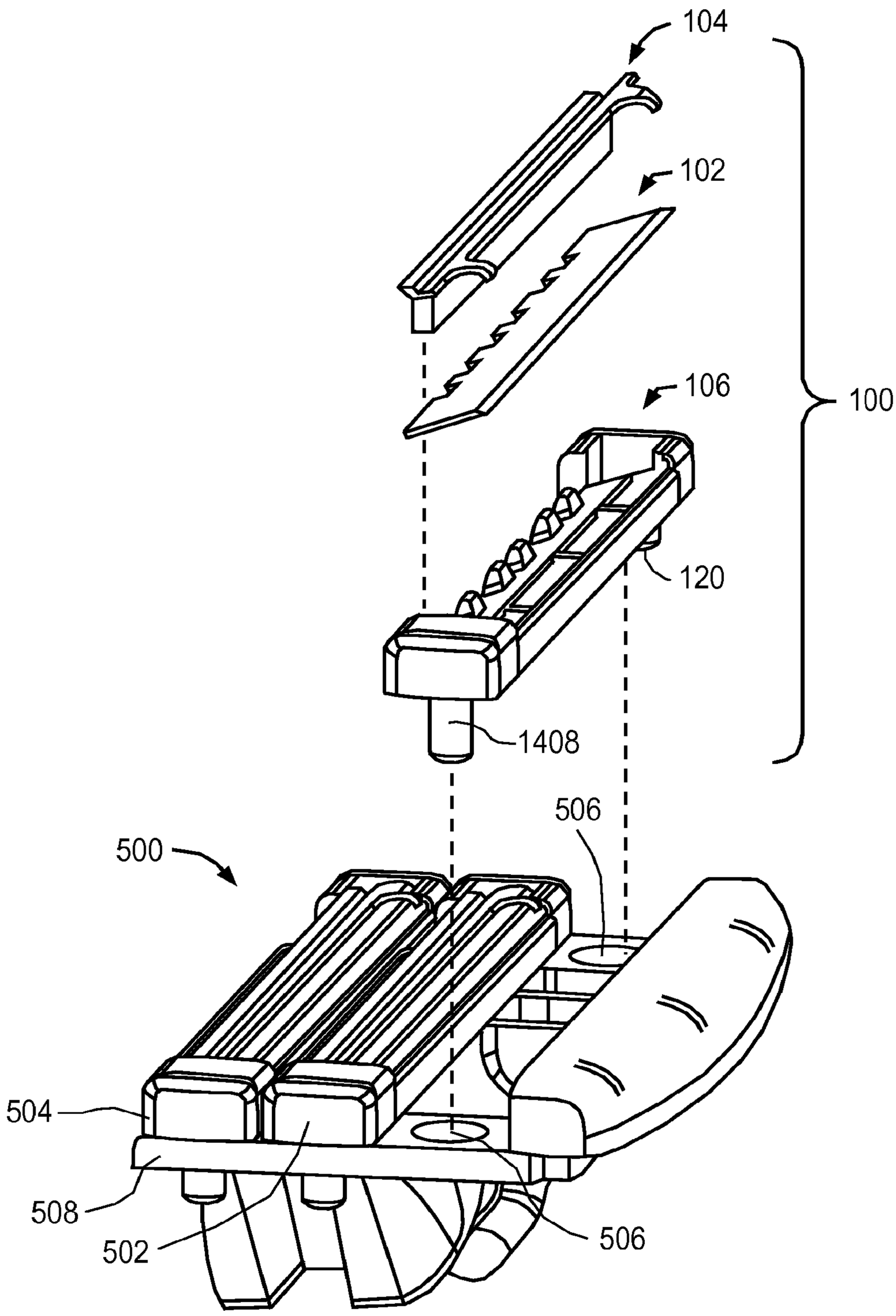

FIG. 8

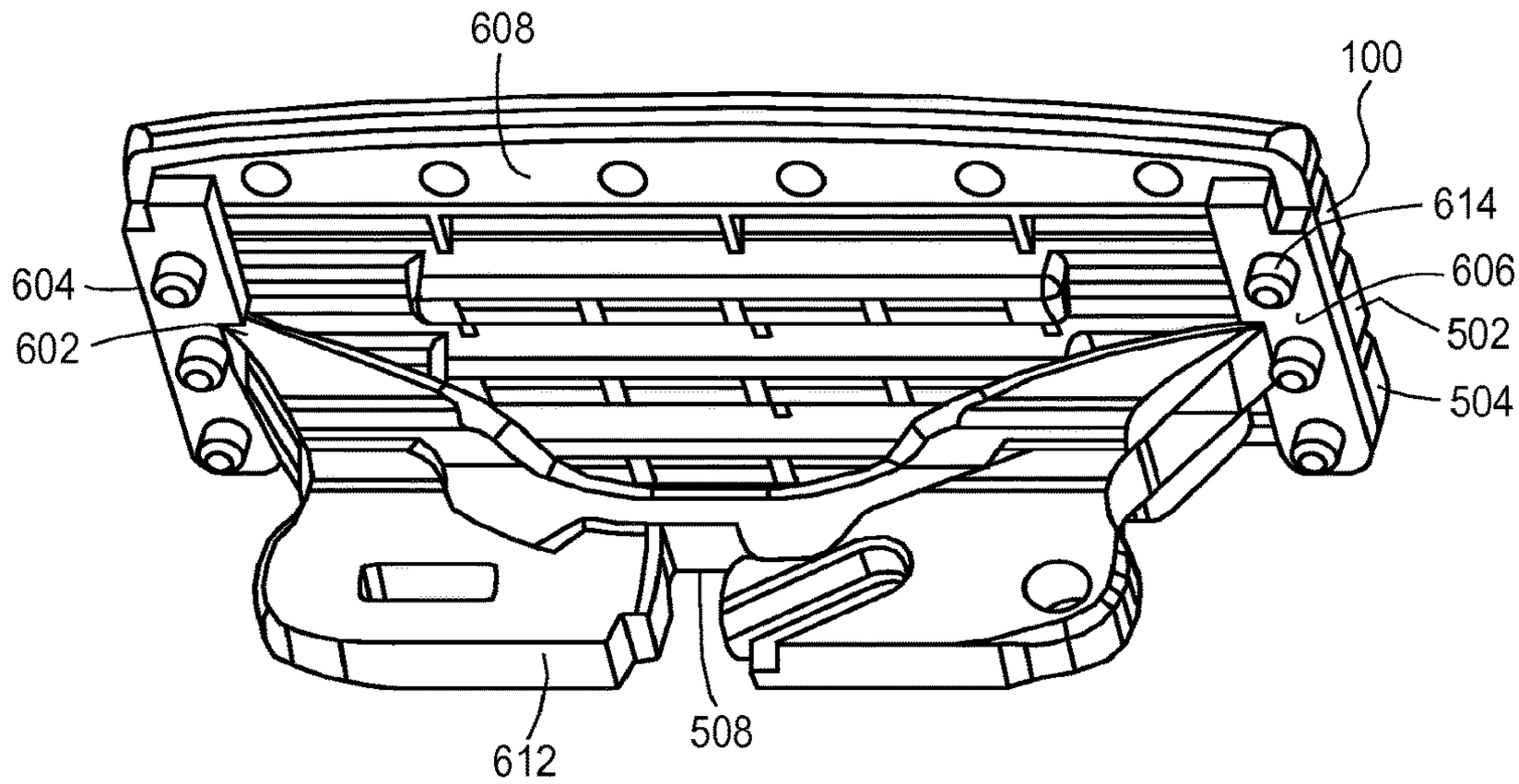

FIG. 9A

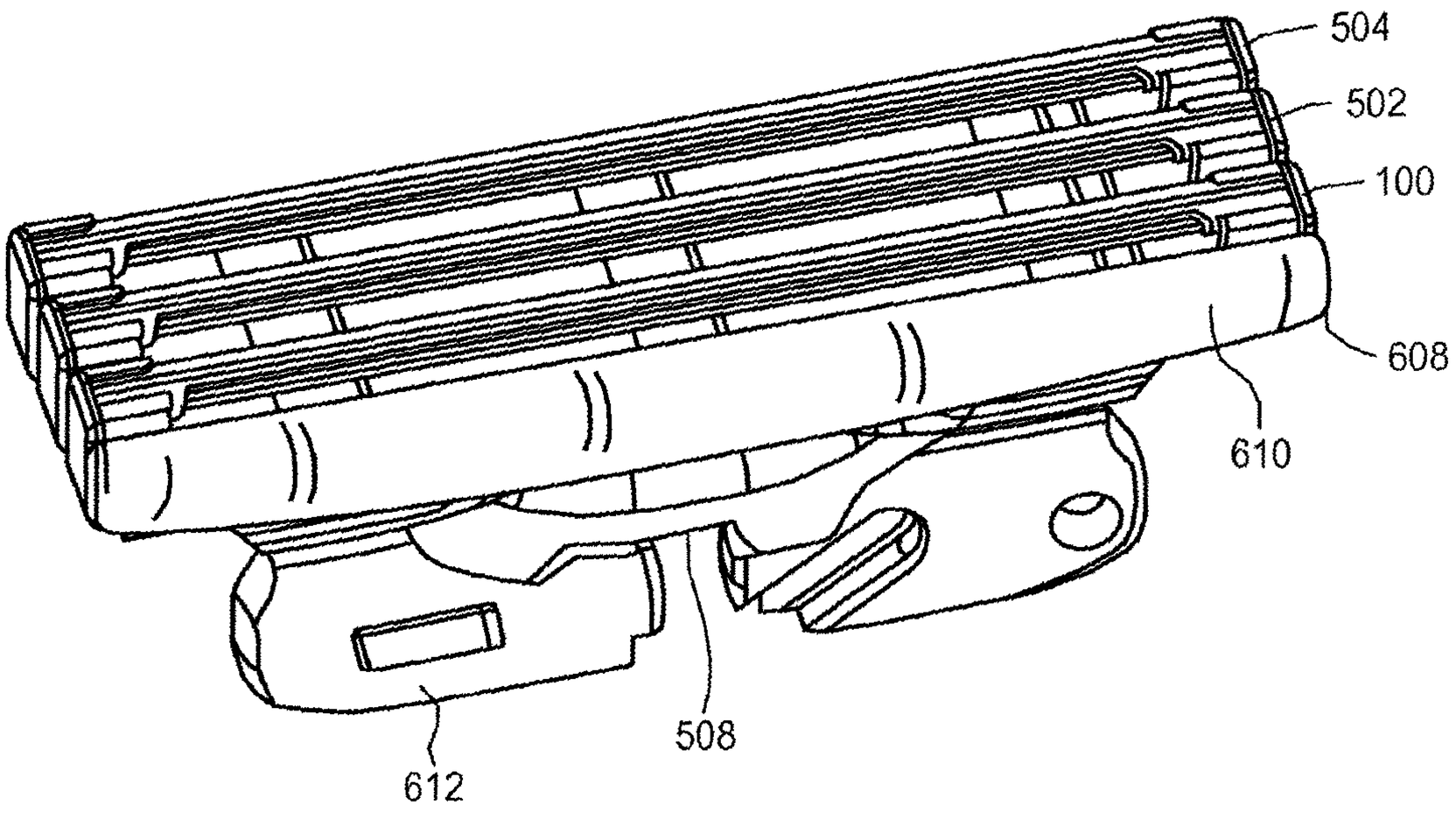

FIG. 9B

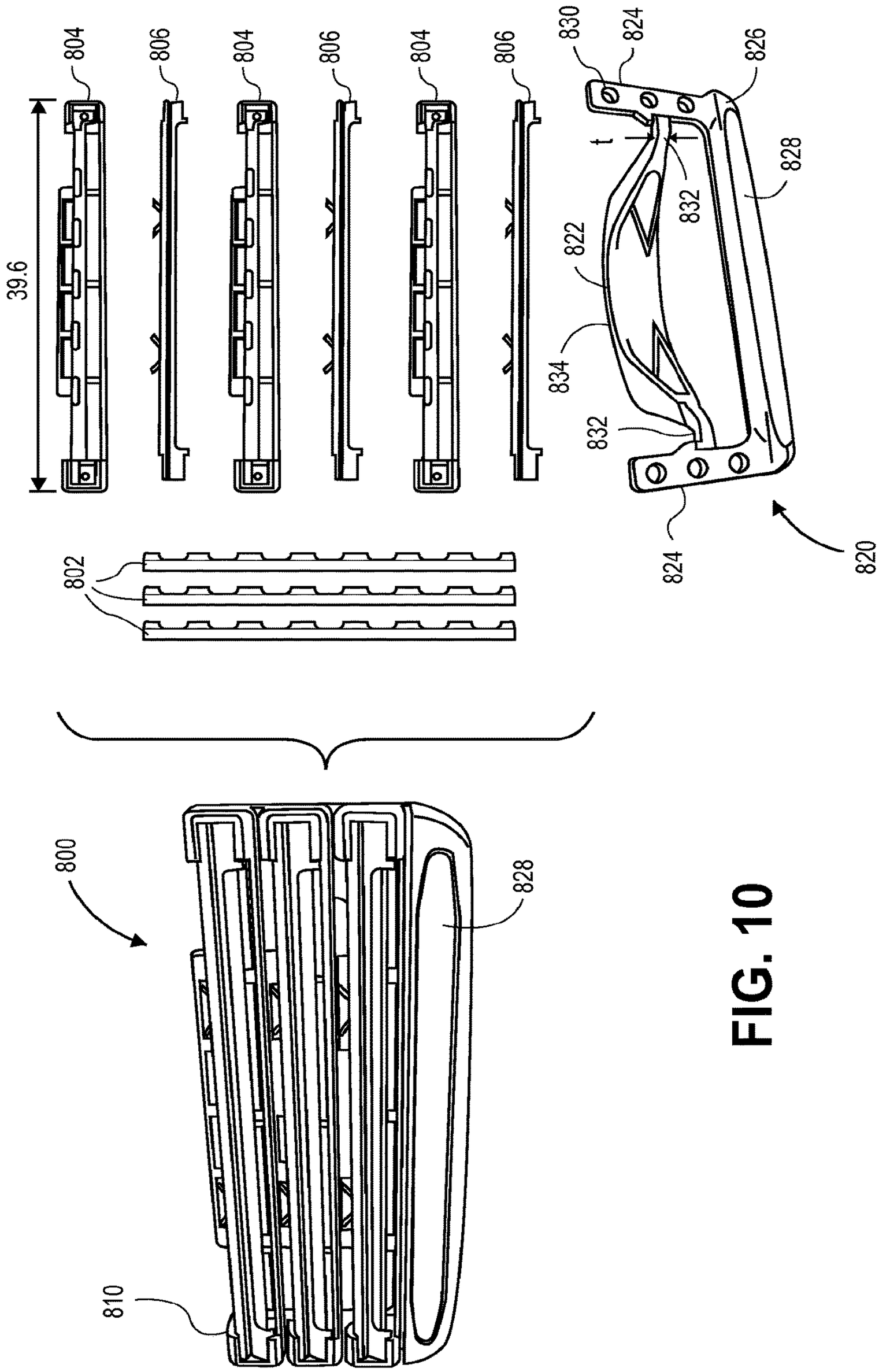
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FIG. 10

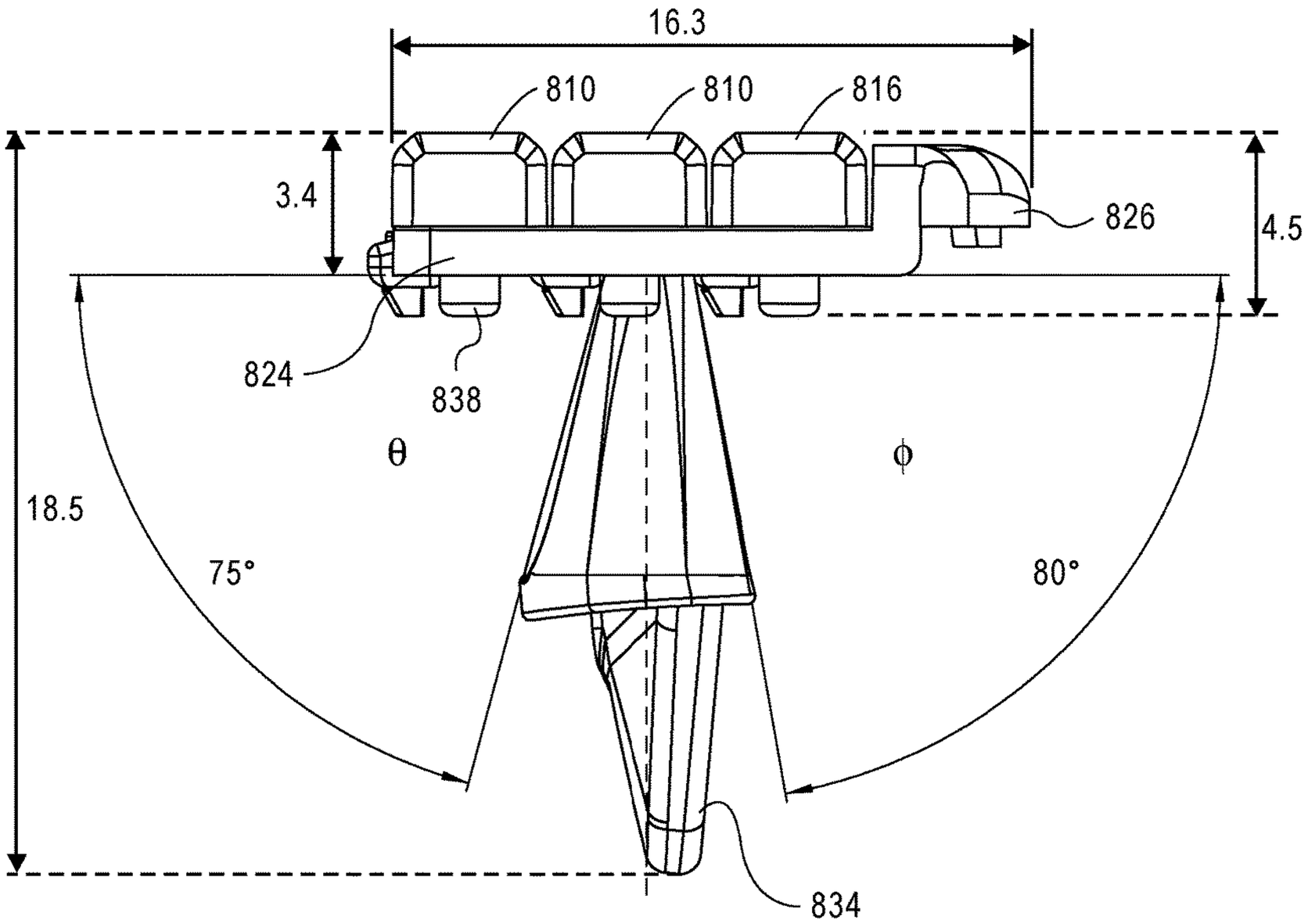

FIG. 11

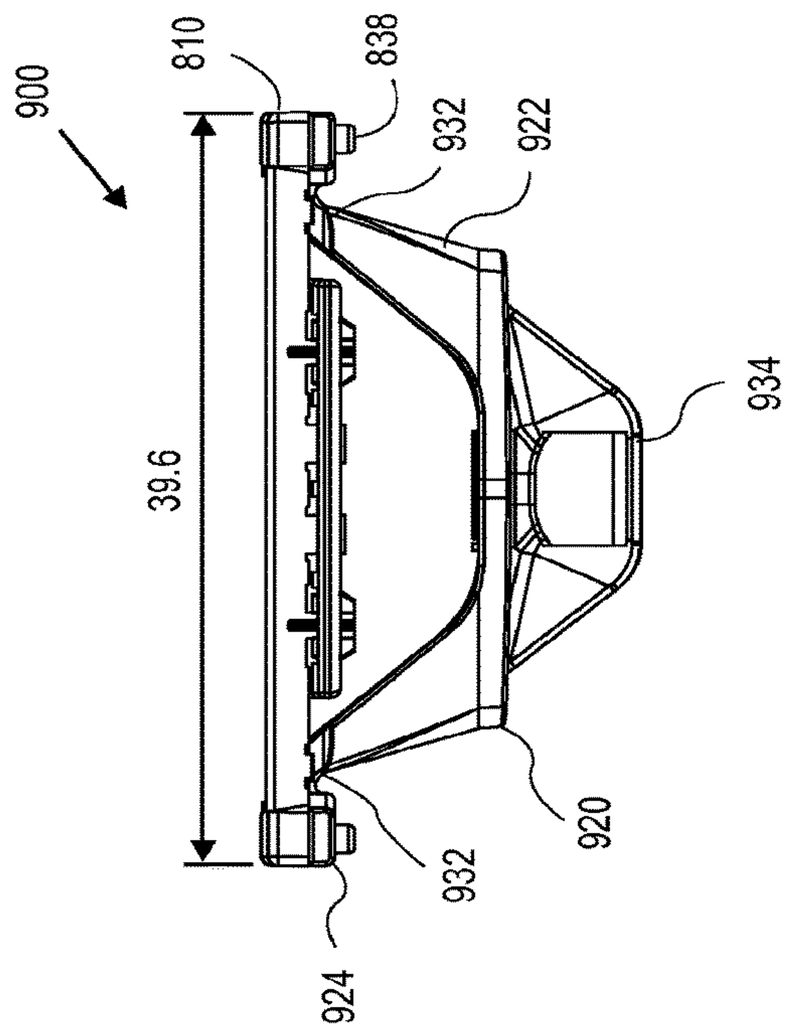

FIG. 12A

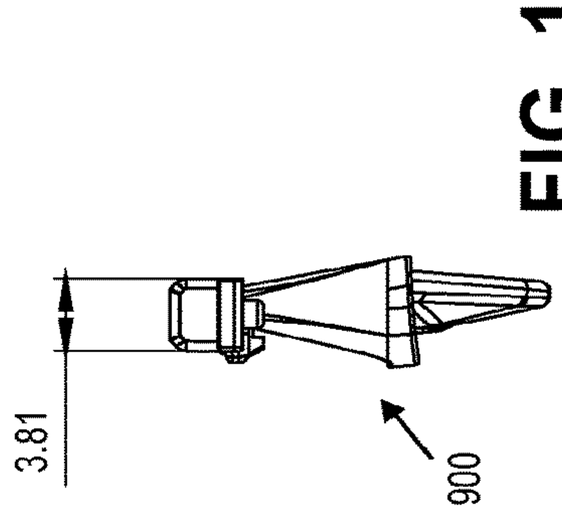

FIG. 12B

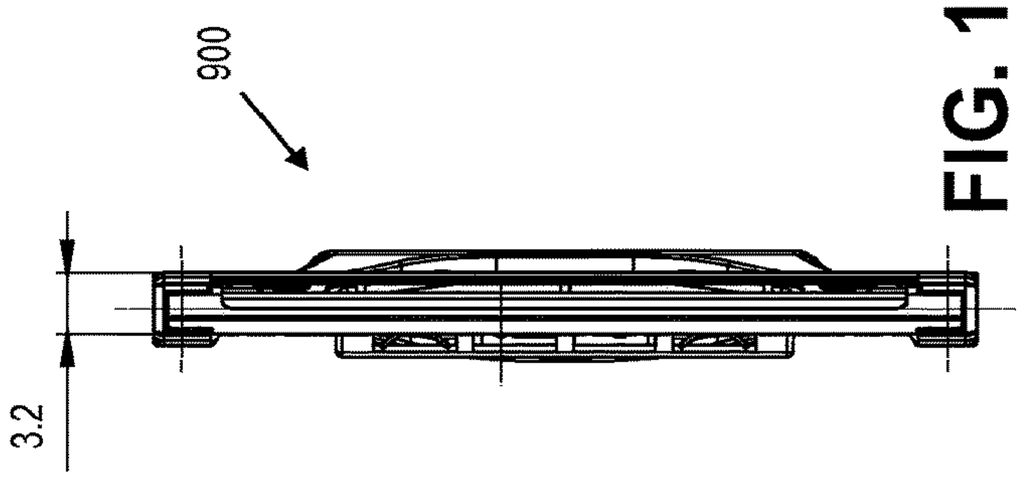

FIG. 12C

RAZOR CARTRIDGE WITH REDUCED PART COUNT AND EXPANDED RANGE OF MOTION

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

This application is a continuation of U.S. application Ser. No. 13/173,911 filed Jun. 30, 2011, now U.S. Pat. No. 9,144,914 B2 entitled "RAZOR CARTRIDGE WITH REDUCED PART COUNT AND EXPANDED RANGE OF MOTIONS."

BACKGROUND

Field

A personal care item, more particularly a shaving device.

Background

A diversity of shaving means are available on the market, for example manually operated, electric shavers, multiple use and disposable shaving devices. Typically, such shaving devices include a gripping handle for conveniently holding one or more cutting blades and a respective cartridge bearing one or more or those blades, secured within. Many of these devices include numerous blades and a host of small part such the manufacture is complex and expensive. Moreover, the resulting products are often bulky making it difficult to shave in corners such as around the nose. Additionally, users often find it difficult to maintain contact between the cutting blades and the skin and the razor traverses the myriad angles of the face.

BRIEF DESCRIPTION OF THE DRAWINGS

The embodiments of the invention are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment of the invention in this disclosure are not necessarily to the same embodiment, and they mean at least one.

FIGS. **1**A and **1**B are schematic diagrams of a rear perspective view and a front perspective view, respectively, of a shaving assembly of an embodiment of the invention;

FIG. **2** is an exploded view of a razor assembly in an embodiment of the invention;

FIGS. **3**A and **3**B are schematic side views of a shaving assembly of an embodiment of the invention in a non-flexed and convex orientation, respectively;

FIG. **4**A illustrates a perspective view of an embodiment of a shaving cartridge.

FIG. **4**B illustrates a cross sectional view of the shaving cartridge of FIG. **4**A along line A, A'.

FIG. **5** illustrates a perspective view of the cover and blade illustrated in FIG. **4**A.

FIG. **6** illustrates a bottom perspective view of the cover and blade illustrated in FIG. **5**.

FIG. **7** illustrates a rear perspective view of the shaving cartridge illustrated in FIG. **4**A.

FIG. **8** illustrates an exploded view of one embodiment of a shaving assembly.

FIG. **9**A illustrates a rear perspective view of the shaving assembly of FIG. **8**.

FIG. **9**B illustrates a front perspective view of the shaving assembly of FIG. **8**.

FIG. **10** is a plan and exploded view of a razor head of one embodiment of the invention.

FIG. **11** is a side view of shaving head of one embodiment of the invention.

FIGS. **12**A-**12**C illustrate an alternative embodiment of the invention having a single cartridge associated with a unitary yoke.

DETAILED DESCRIPTION

Several embodiments of the invention with reference to the appended drawings are now explained. Whenever the shapes, relative positions and other aspects of the parts described in the embodiments are not clearly defined, the scope of the invention is not limited only to the parts shown, which are meant merely for the purpose of illustration.

FIGS. **1**A and **1**B are schematic diagrams of a rear perspective view and a front perspective view respectively of a shaving assembly of one embodiment of the invention. A plurality of independent cartridges **240**, **250** and **260** are coupled to a pair of cross pieces **202** of a cartridge support. Cartridge support also includes a bridge **204** spanning between cross pieces **202**. Bridge **204** is coupled to each cross piece **202** at an attachment point **216**.

In the shown embodiment, three independent cartridges, leading cartridge **260**, middle cartridge **250** and following cartridge **240** are used. In one embodiment, each cartridge is independently attached to a cross piece **202** with middle cartridge **250** being attached substantially at the attachment point **216** and leading and following cartridges **260** and **240** being attached on either side adjacent thereto. The composition of each cartridge is described more fully with reference to FIG. **2** below. Generally, cross pieces **202** are flexible and can flex between a concave and a convex orientation. This is discussed more fully below with reference to FIGS. **3**A and **3**B. At rest, e.g., when no force is applied, cross pieces **202** are substantially planar. Cartridges **240**, **250** and **260** may be attached to cross pieces **202** using adhesive, rivets, heat welding or any conventional attachment mechanism or a combination thereof. The positioning of the cartridges along cross piece **202** and in particular the finite space "d" between each cartridge pair (better shown in FIGS. **3**A and **3**B) dictates the amount of concavity that a face of the razor can achieve before contact between the adjacent cartridges prevents further movement. Because each of the cartridges **240**, **250** and **260** is independent, the relative movement of one cartridge, as the razor face becomes convexed, is not affected by the other cartridges. Such movement is only constrained by the flexibility and resilience of the cross piece **202**.

As used herein, "leading" refers to earlier in position relative to the direction of shaving. Thus, leading cartridge **260** encounters an area to be shaved before middle cartridge **250** as the assembly is pulled along the shaving area. In one embodiment, the shaving assembly includes a leading platform **214** on which may be disposed a lubricating strip **280**. Leading platform **214** may be attached to or formed with cross pieces **202**. Lubricating strip **280** is positioned to release lubrication in advance of leading cartridge **260**.

In some embodiments, each cartridge may also have its own lubricating strip **208**, which lubricates the area to be shaved before the next successive cartridge arrives. Leading platform **214** may include perforations **224** to improve the adhesion of the lubricating strip **208**. In an alternative embodiment, lubricating strip **208** may be replaced with flexible ribs or mirror fans that raise the drain in advance of leading cartridge **260**. A handle interconnect **272** is coupled to the bridge **204** to allow the shaving assembly to be coupled to a razor blade handle. Handle interconnect **272** may provide for reciprocation of the entire assembly when attached to a handle. Razor interconnect **272** may have any necessary configuration to allow it to connect to the myriad possible razor handles commercially available or subsequently designed.

FIG. **2** is an exploded view of the shaving assembly in one embodiment of the invention. Leading cartridge **260** is shown exploded. Each cartridge includes a blade **306** and a carrier having a base **302** and a cap **304**, which together retain the blade **306**. The base **302** and cap **304** may be injection molded out of any suitable plastic or other material, for example, extruded from plastic or aluminum. In one embodiment, base **302** is integrally formed with mounting pegs **310** extending therefrom. Mounting pegs **310** engage holes **312** in cross piece **202** and may be heat welded or otherwise adhered therein. Cap **304** is designed to snap fit into base **302** to retain blade **306**. Base **302** defines channels **308** through which shaved hair may pass without clogging or blocking blade **306**.

In various embodiments, cross piece **202** may be formed from commercially available elastomeric nylon 12, polyurethane, or any other suitably resilient synthetic material. Generally, it is desirable for cross piece **202** to have sufficient resilience to deform and return to its generally planar original state for at least 8000 cycles. Resilience of 10,000 cycles or more is preferred. In some embodiments, cross piece **202** and bridge **204** are molded or extruded integrally as a unit. In some other embodiments, cross piece **202** and base **302** are molded integrally as a unit. It should be noted that when the bases **302** of each cartridge can be formed integrally as one piece with each other and that in such case there is no need for a bridge **204**.

FIGS. **3**A and **3**B are schematic side views of a shaving assembly an embodiment of the invention, in an unflexed and a convexed orientation, respectively. A cross member **402** is coupled to a bridge **404** and retains independent cartridges **440**, **450** and **460**. The bidirectional arrows in the figure are indicative of the ability of the cross members **402** to flex around attachment point **416** into either a concave or a convex orientation. Finite space "d" exists between adjacent cartridge pairs **440**, **450** and **460**. The finite space "d" dictates the amount by which cross member **402** can flex to concave the face of the shaving assembly. As cross member **402** flexes into a concave orientation adjacent cartridges come into contact and prevent further concavity. In the absence of a finite space "d", cross member **402** (once assembled) will only be able to flex in a direction to cause the face to become convexed. The convex orientation assists in shaving a tight area, such as under a user's nose while the concave orientation assists in shaving around angular portions, such as the chin. Generally speaking, the need for convex flexibility exceeds that for concave flexibility. In the shown embodiment, leading platform **414** supports a series of micro ribs, which may be formed of an elastomeric material and are designed to lift the hair in advance of the blade from leading cartridge **460**. It should be understood that the micro ribs could be replaced in whole or in part by a lubricating strip on the leading platform **414**.

FIG. **3**B shows cross member **402** flexed in a convexed, orientation leading about attachment point **416**. As previously noted, this orientation makes it easier to get into tight spaces, such as around a user's nose. Notably, leading platform **414** provides leverage to facilitate this flexion as a user presses the assembly against the area to be shaved wherein the leading platform **414** provides a lever arm to initiate bending about attachment point **416**.

FIG. **4**A illustrates a perspective view of an embodiment of a shaving cartridge. Shaving cartridge **100** may include blade **102**, cover **104** and base member **106**. In some embodiments, blade **102** may be a razor blade. Cover **104** may be secured to blade **102**. Cover **104** may further be attached to base member **106** and retain blade **102** in place within cartridge **100**. Cover **104** is positioned over blade **102** such that during shaving, cover **104** and cutting edge **112** of blade **102** contact the user's skin. In this aspect, cover **104** defines a recessed portion **118** along cutting edge **112** so that a portion of cutting edge **112** is exposed to the user's skin. Cover **104** may serve as a protective cover over blade **102**.

Cover **104** defines a channel **114** adjacent to blade **102**. In one embodiment, the channel is generally V-shaped. The channel may be defined by a first panel **108** and a second panel **110**. In addition to serving as a protective cover, cover **104** may be dimensioned to spread the pressure of cutting edge **112** across the skin better than conventional razor blade cartridges and improve cutting edge **112** glide across the skin so as to reduce nicks and cuts. These advantages are achieved, at least in part, by decreasing the surface area of cover **104** and cutting edge **112** contacting the user's skin by approximately 60% as compared to the conventional razor blade cartridges. Stated slightly differently, if one were to draw a bounding box around the cartridge in the shaving plane, the area above the channel represents 60% of the area within the bounding box.

Cover **104** with blade **102** attached thereto is positioned on base member **106** such that during a shaving operation, upper edge **116** of second panel **110** and cutting edge **112** define cutting plane **122**. Portions of cover **104** within channel region **114** remain raised above cutting plane **122** during shaving and therefore do not contact the user's skin. Additionally, upper edge **116** stretches the skin to increase the closeness of the shave.

Cover **104** may be made of any material suitable for contacting a user's skin during shaving. Representatively, cover **104** may be made of a metal material, for example, aluminum. In still further embodiments, cover **104** may be made of other materials such as a plastic material. In some embodiments, cover **104** may be stamped from an aluminum sheet as a single unit. In other embodiments, cover **104** may be formed by any process known in the art such as injection molding, machining or any other manufacturing process suitable for generating the desired features of cover **104**.

In embodiments where cover **104** is made of a metal material, a lubricating coating may be applied to cover **104** to facilitate movement of cartridge **100** across the user's skin. Representatively, an electrostatic spray coating method may be used to apply solids such as telomers as dispersions in water, alcohols, freons, or various fluorocarbon liquids, for example, an aqueous dispersion of tetrofluoroethylene telomer along upper edge **116** of cover **104**. Alternatively, a lubricating strip infused with a lubricating material, for example, aloe vera and/or coconut milk, may be attached to cover **104**. Any of the above discussed lubricating coatings

and/or materials may further be disposed on portions of base member **106** contacting the user's skin.

Attachment of cover **104** and blade **102** to base member **106** may be achieved by welding cover **104** directly to blade **102**. Representatively, cover **104** may be spot welded to blade **102** at various points along a length dimension of blade **102**. Cover **104** may then be attached to base member **106** as will be discussed in more detail in reference to FIG. **7**. The use of cover **104** to attach blade **102** to base member **106** as disclosed herein, as opposed to attaching blade **102** directly on base member **106**, results in a more rigid cartridge **100** that maintains blade **102** shape. It is believed that this results in a longer lasting blade having better gliding capabilities.

Base member **106** may include mounting peg **120** to facilitate attachment of base member **106** to a bridge as will be discussed in further detail in reference to FIG. **7**. In one embodiment, base member **106** is integrally formed with mounting peg **120** extending therefrom. Base member **106** may further include elongated aperture **124** through which shaved hair may pass without clogging or blocking blade **102**.

FIG. **4**B illustrates a cross sectional view of the shaving cartridge of FIG. **4**A along line A, A'. FIG. **4**B shows shaving cartridge **100** of FIG. **4**A rotated so that cutting edge **112** is positioned along skin **126** to shave hairs **128** extending therefrom. From this view, it can be seen that cutting plane **122** is defined by upper edge **116** of second panel **110** and cutting edge **112**. During shaving of hairs **128** extending from skin **126**, channel **114** of cover **104** is raised above skin **126** such that only upper edge **116** of cover **104** and cutting edge **112** slide along the skin. In some embodiments, channel **114** may help to retain lubricating and/or moisturizing fluids used during shaving, such as soaps, foams, water, etc., against skin **126**. Such feature may further improve the glide of cartridge **100** against skin **126** and the condition of skin **126** in general after shaving.

FIG. **5** illustrates a perspective view of the cover and blade illustrated in FIG. **4**A. As previously discussed, cover **104** may include first panel **108** and second panel **110**. Recess **118** may be formed within first panel **108** to expose a portion of cutting edge **112** of blade **102** attached thereto. From this view, a depth of channel region **114** with respect to cutting plane **122** formed by edge **116** and cutting edge **112** can be more clearly seen. In particular, it can be seen that only edge **116** of second panel **110** and cutting edge **112** are within cutting plane **122**. As a result, during shaving, only edge **116** and cutting edge **112** contact the user's skin, while channel region **114** of cover **104** remains raised above the surface of the skin.

Cover **104** may further include stop members **1202** and **1204** extending from first panel **108**. Stop members **1202** and **1204** are dimensioned to extend around cutting edge **112**. In this aspect, stop members **1202** and **1204** help to properly position blade **102** and, in particular, cutting edge **112**, within cover **104**. Stop members **1202** and **1204** may be integrally formed with cover **104**.

In addition, cover **104** may include tabs **1206**, **1208**, **1210** and **1212** for securing cover **104** to base member **106**. Tabs **1206**, **1208**, **1210** and **1212** may extend below cover **104** so that they can be secured to underlying base member **106**. Although FIG. **5** shows tabs **1206** and **1208** as substantially straight, planar structures, to secure tabs **1206** and **1208** to base member **106**, tabs **1206** and **1208** may be bent as will be discussed in more detail in reference to FIG. **6** and FIG. **7**. Tabs **1210** and **1212** may be positioned between tabs **1206** and **1208**. Tabs **1210** and **1212** may be substantially straight structures which include barbed portions **1214** and **1216**, respectively, at the ends. When cover **104** is positioned within base member **106**, barbed portions **1214**, **1216** catch on portions of base member **106** to secure cover **104** to base member **106**.

FIG. **6** illustrates a bottom perspective view of the cover and blade illustrated in FIG. **5**. From this view, it can be seen that cover **104** further includes back plate **1302** extending from second panel **110**. Back plate **1302** extends below blade **102** and along a back side of base member **106** (see FIG. **7**). In this aspect, back plate **1302** helps to align blade **102** and cover **104** with base member **106**. Tabs **1206**, **1208**, **1210** and **1212** may be integrally formed with back plate **1302**. In FIG. **6**, tabs **1208** and **1206** are shown in a bent configuration used to secure cover **104** to base member **106**.

FIG. **7** illustrates a rear perspective view of the shaving cartridge illustrated in FIG. **4**A. From this view, the manner in which cover **104** is attached to base member **106** can be seen. In particular, to attach cover **104** to base member **106**, back plate **1302** of cover **104** is positioned along a back side of base member **106**. Tabs **1206** and **1208** are then bent around an underside of base member **106**. Tabs **1210** and **1212** are inserted through slots **1402** and **1404**, respectively, formed by bracket **1406** along an underside of base member **106**. Barbs **1214** and **1216** of tabs **1210** and **1212**, respectively, catch on edges of slots **1402** and **1404** to hold tabs **1210** and **1212** in place.

Base member **106** may include pegs **120** and **1408**. Pegs **120** and **1408** may be used to secure base member **106** to a bridge as will be discussed in more detail in reference to FIG. **8**.

FIG. **8** illustrates an exploded view of one embodiment of a shaving assembly. Shaving assembly **500** may include a plurality of cartridges **100**, **502** and **504**. Cartridge **100** may be substantially the same as cartridge **100** described in reference to FIG. **4**A. Cartridges **502** and **504** may be substantially the same as cartridge **100**. In FIG. **8**, cartridge **100** is shown exploded.

Each cartridge includes cover **104** and base member **106**, which together retain blade **102** within cartridge **100**. In one embodiment, base member **106** is integrally formed with mounting pegs **120** and **408** extending therefrom. Mounting pegs **120** and **408** engage holes **506** in bridge **508** and may be heat welded or otherwise adhered therein. In various embodiments, bridge **508** may be formed from commercially available elastomeric nylon 12, polyurethane, or any other suitably resilient synthetic material. It should be noted that base member **106** of each cartridge can be formed integrally as one piece with each other. Bridge **508** may in turn be attached to a handle interconnect member to attach cartridges **100**, **502** and **504** to the razor handle as will be discussed in more detail in reference to FIGS. **9**A and **9**B.

FIGS. **9**A and **9**B illustrate a rear perspective view and a front perspective view, respectively, of the shaving assembly of FIG. **8**. A plurality of independent cartridges **100**, **502** and **504** such as those previously discussed in reference to FIG. **8** are coupled to bridge **508**.

In the illustrated embodiment, three independent cartridges, leading cartridge **100**, middle cartridge **502** and following cartridge **504** are used. In one embodiment, each cartridge is independently attached to bridge **508**. Middle cartridge **502** may be attached substantially at the attachment point **602** and leading and following cartridges **100** and **504** may be attached on either side adjacent thereto.

In some embodiments, bridge **508** may be flexible and can flex between a concave and a convex orientation. In this aspect, cross pieces **604** and **606** of bridge **508** may be

formed from commercially available elastomeric nylon 12, polyurethane, or any other suitably resilient synthetic material. At rest, e.g., when no forced is applied, cross pieces **604** and **606** of mounting assembly **508** are substantially planar. Cartridges **100**, **502** and **504** may be attached to cross pieces **604** and **606** using, for example, rivets **614**. In still further embodiments, cartridges **100**, **502** and **504** may be attached to cross pieces **604** and **606** using any other conventional attachment mechanism such as an adhesive, heat welding or a combination thereof. Because each of the cartridges **100**, **502** and **504** is independent, the relative movement of one cartridge as the razor face becomes convexed is not affected by the other cartridges. Such movement is only constrained by the flexibility and resilience of cross pieces **604** and **606**. In such an embodiment, the blades of the collection of cartridges define a plane when the razor in its rest state, e.g. no force is being exerted on the shaving head. In an alternative embodiment, cross pieces **604** and **606** may not be flexible such that the all cartridges are retained in a substantially rigid shaving plane.

As noted above the leading cartridge **100** encounters an area to be shaved before middle cartridge **502** as the assembly is pulled along the shaving area. In one embodiment, the shaving assembly may include leading platform **608**. Leading platform **608** may be attached to, or formed with, cross pieces **604** and **606**. Lubricating strip **610** is positioned to release lubrication in advance of leading cartridge **100**.

In some embodiments, lubricating strip **610** (see FIG. **9**B) may be applied to leading platform **608**. In addition or in the alternative, each cartridge **100**, **502** and **504** may also have its own lubricant as previously discussed to lubricate the area to be shaved before the next successive cartridge arrives. In an alternative embodiment, lubricating strip **610** may be replaced with flexible ribs that raise the hair in advance of leading cartridge **100**.

Handle interconnect **612** may be coupled to mounting assembly **508** to allow the shaving assembly to be coupled to a razor handle. Razor interconnect **612** may have any necessary configuration to allow it to connect to the variety of possible razor handles commercially available or subsequently designed.

FIG. **10** shows a plan and exploded view of a razor head of one embodiment of the invention. Razor head **800** has a plurality of razor cartridges **810** forming a part thereof. Razor cartridges **810** comprise a blade **802**, a base **804**, and a cover **806** and may be manufactured as described in connection with FIGS. **4**A-**9** above. In the shown embodiment, three cartridges **810** are coupled to a yoke **820**. Yoke **820** is molded as a single unitary piece of material. In one embodiment, the yoke is molded from thermoplastic. In one embodiment, the selected material is EMS Grillflex ELG 5660 manufactured by EMS-GRIVORY. However, other thermoplastics may be used.

Yoke **820** includes a bridge **822** integrally formed with a pair of cross pieces **824**, which define attachment points **830** to receive cartridges **810**. Bridge **822** couples to cross pieces **824** by a pair of living hinges **832**. Living hinges have a thickness t, which permits the blade assembly to pivot about a living hinge in forward and backward directions through a first and second arc. In one embodiment t is equal to 1 mm±0.1 Other embodiments may have a greater or lesser t. The arc of pivot is limited by thickness t and the rigidity of the material forming the living hinges **832**. By selecting an appropriate material for molding premature fatigue at the living hinges is avoided. In one embodiment, attachments points **830** are a series of bores defined through cross pieces **824**. Cross pieces may have the same flexibility characteristics as described with other embodiments above. This permits attachment pegs **838** of base **804** (shown in FIG. **11**) to be heat welded within the bore **830**. In one embodiment, each cartridge **810** has a length dimension of 39.6 millimeters which spans between the cross pieces **824**. Other dimensions are contemplated as within the scope of other embodiments of the invention.

In some embodiments, yoke **820** includes a leading platform **826**, which may define a well **828** to receive a lubricating material. In this manner, lubricating material is applied to skin in advance of a leading blade of a leading cartridge within the assembly. Also molded as part of yoke **820** in one embodiment of the invention is a handle attachment piece **834**, which permits a handle, such as a conventional stick handle or any other suitable handle to be attached to the blade assembly. Notably, while in some embodiments cartridges **810** are as described in connection with FIGS. **4**A-**9**, in other embodiments, cartridges as described relative to FIGS. **1**A-**3**B may be attached to the unitary yoke **820**. In another embodiment, the bases **804** of the cartridges **810** are molded integrally with the yoke **820**.

From a manufacturing standpoint, the embodiment described as reference to FIG. **10** includes exactly four unique parts (three of those parts are replicated three times for a total part count for a three cartridge blade assembly of ten). This part count is less than half a part count associated with the products of current market leaders Gillette and Schick. By way of example, the Schick Hydro includes twenty-five distinct parts and the Gillette Fusion includes twenty-four distinct parts. In embodiments in which the bases **804** are molded integrally with the yolk **820**, the part count is reduced by the number of bases. Additionally, the manufacturing step of base attachment is avoided.

FIG. **11** is a side view of shaving head of one embodiment of the invention. Certain dimensions of one embodiment in millimeters are shown. In one embodiment, living hinges **832** allow cross pieces **824** and cartridges coupled thereto to pivot forward through an arc ϕ, which in one embodiment is 80 degrees. For purposes of comparison The Gillette Fusion has a maximum pivot arc of 55 degrees in a single direction. The same living hinges permit cartridges **810** and cross piece **824** to pivot backwards in arc θ of, for example, 75 degrees. In other embodiments, ϕ may be 60 degrees or 50 degrees and θ may be selected to be, for example, 50 or 40 degrees. The forward and backward arcs are defined from a rest position, the rest position being the position of the head when no force is applied. However, a greater arc of pivot increases the range of angles of the handle over which the blades **802** will remain on a user's skin in an effective position. In one embodiment, cross pieces **824** are also flexible, such that the overall face of the razor may flex to be concave or convex as described above in connection with FIGS. **3**A-**3**B. In an alternative embodiment, cross pieces **824** may not be flexible such that while the head can pivot about the living hinges the all cartridges are retained in a shaving plane.

FIGS. **12**A-**12**C are depictions of an alternative embodiment of the invention having a single cartridge associated with a unitary yoke. A shaving head **900** includes a yoke **920** having a bridge **922** that couples to cross pieces **924**. Cross pieces **924** define an attachment point for a single cartridge **810**. For example, cross pieces **924** may define a bore to receive integrally molded attachment peg **838** and coupling may be by heat welding, adhesion or any other suitable manner. Yoke **920** may include a handle attachment piece **934** to allow the assembly to be coupled to a shaving razor handle. In the shown embodiment, the long dimension of the

cartridge is 39.6 millimeters. However, reduced sized cartridges, being for example, 19.8 millimeters are within the scope and contemplation of the invention. Other sizes are also within the scope and contemplation of the invention.

FIG. **12**B shows a side view of a single cartridge embodiment of the invention. This view reveals the cross dimension of one embodiment of the cartridge is 3.81 millimeters. FIG. **12**C shows a top plan view of a single cartridge embodiment. In this view, the dimension of the cover blade assembly can be seen to be 3.2 millimeters. These small dimensions permit the razor to function effectively in tight spaces such as around the nose.

While explicit dimensions are shown and described in connection with various embodiments, it is within the scope and contemplation to change those dimensions. Thus, the actual dimensions may be larger or smaller than the dimensions detailed. However, it has been found that the dimensions shown yield a quality product providing an exceptional shave.

In the foregoing specification, the embodiments of the invention have been described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes can be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. A shaving razor comprising:

a yoke molded as a single piece, the yoke including a bridge and a pair of cross pieces coupled to the bridge each by a living hinge, the cross pieces are coupled to define an angle with the bridge, the living hinge defining a vertex of the angle;

a cartridge having a razor blade coupled to the yoke to span between the cross pieces wherein a longitudinal axis of the blade is substantially perpendicular to the cross pieces; and

at least a second cartridge having at least one blade and coupled to the yoke to span between the cross pieces the cartridges collectively forming a blade assembly

wherein at least one of the cartridges is disposed on the cross pieces ahead of the living hinges and at least another one of the cartridges is disposed on the cross pieces after the living hinge in a shaving direction.

2. The shaving razor of claim **1** wherein the living hinges permit the cartridges coupled to the cross pieces to pivot backward through a first arc of greater than 50 degrees, the first arc defined relative to a rest position.

3. The shaving razor of claim **1** wherein the razor blade is exactly one blade in the first cartridge, the at least one blade is exactly one blade in the second cartridge, and wherein the shaving head consists of the yolk, a plurality of cartridges including the cartridge and the second cartridge; wherein each of the cartridges of the plurality comprises the exactly one blade, exactly one base and exactly one cover.

4. The shaving razor of claim **1** wherein the yoke further comprises:

a leading platform to contact a user's skin in advance of a leading one of the razor blades.

5. The shaving razor of claim **1** wherein each cartridge comprises:

a base; and

a cover coupled to the blade lengthwise along a surface of the blade and the base, the cover defining a channel that lags a cutting edge of the blade.

6. The shaving razor of claim **1** wherein each of the cartridges is discrete, the razor blade is exactly one blade, the at least one blade is exactly one blade, and all of the cartridges are oriented to shave in a same direction.

7. The shaving razor of claim **6** wherein each of the cartridges comprises no more than the exactly one blade, a cover and a base.

8. A shaving razor for shaving hair from the skin of a user, the shaving razor comprising:

a plurality of blades including a first blade having a first cutting edge and a second blade having a second cutting edge; and

a support structure supporting the plurality of blades for shaving in a shaving direction, the support structure providing at least one skin contact surface deployed between the first cutting edge and the second cutting edge,

wherein the plurality of blades and the support structure define a skin contact profile in a direction of successive contact with the skin of the user when moved in the shaving direction, the skin contact profile including:

(i) the first cutting edge;

(ii) a channel defining a first region of non-contact with the skin;

(iii) the at least one skin contact surface;

(iv) a gap defining a second region of non-contact with the skin; and

(v) the second cutting edge.

9. The shaving razor of claim 8, wherein the at least one skin contact surface is integrally formed with stop members configured for retaining the first blade on the support structure.

10. The shaving razor of claim 8, wherein the at least one skin contact surface is integrally formed with a plate that extends away from the skin contact profile.

11. The shaving razor of claim 10, wherein the plate is one of a pair of plates deployed between the first blade and the second blade, the pair of plates being separated by a space.

12. The shaving razor of claim 8, wherein the support structure comprises an integrally-molded base member for supporting the plurality of blades.

13. The shaving razor of claim 12, wherein the support structure comprises at least one blade support member for supporting the first blade and at least one blade support member for supporting the second blade.

14. The shaving razor of claim 8, wherein the support structure comprises a base member and a cover for each of the plurality of blades, and wherein each of the plurality of blades is retained by closure of the cover against the base member.

15. The shaving razor of claim 8, wherein the plurality of blades further includes a third blade having a third cutting edge, and wherein the skin contact profile after the second cutting edge further includes:

an additional channel defining a third region of non-contact with the skin;

at least one additional skin contact surface provided by the support structure;

a gap defining a fourth region of non-contact with the skin; and

the third cutting edge.

* * * * *