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(54) **PARTICULATE COLLECTOR FOR DRUMS**

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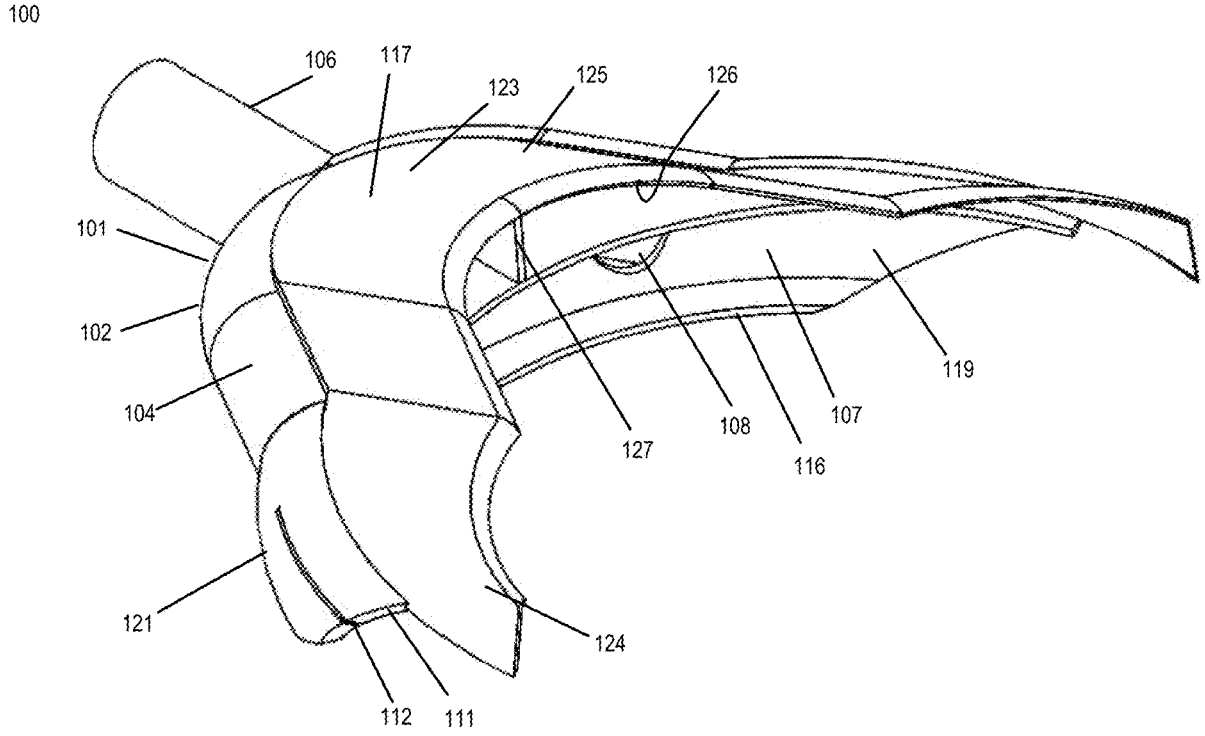
(57) **ABSTRACT**

Collector for attachment to a vacuum cleaner to collect particulates spilling out of a drum during mixing.



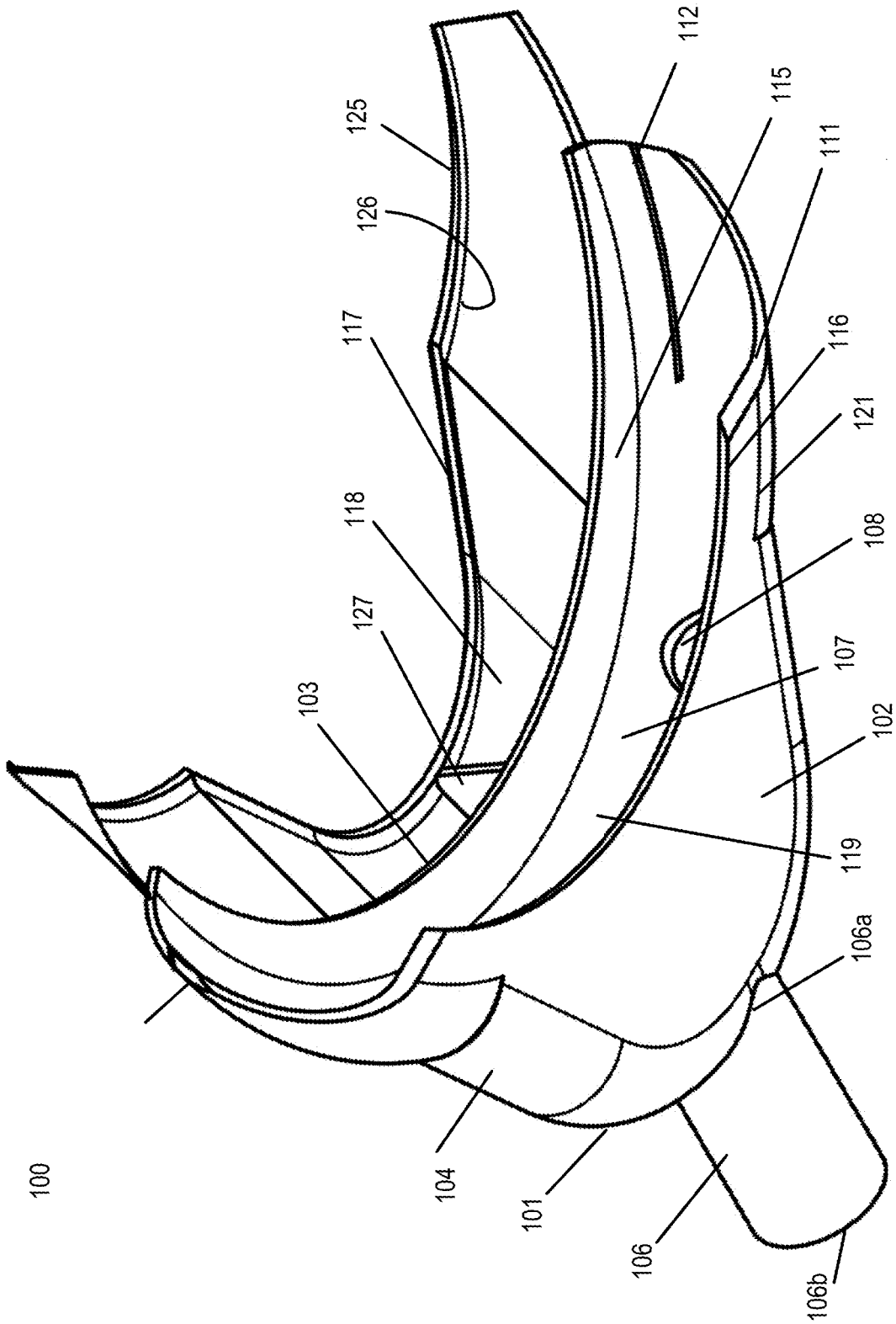

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Fig. 1

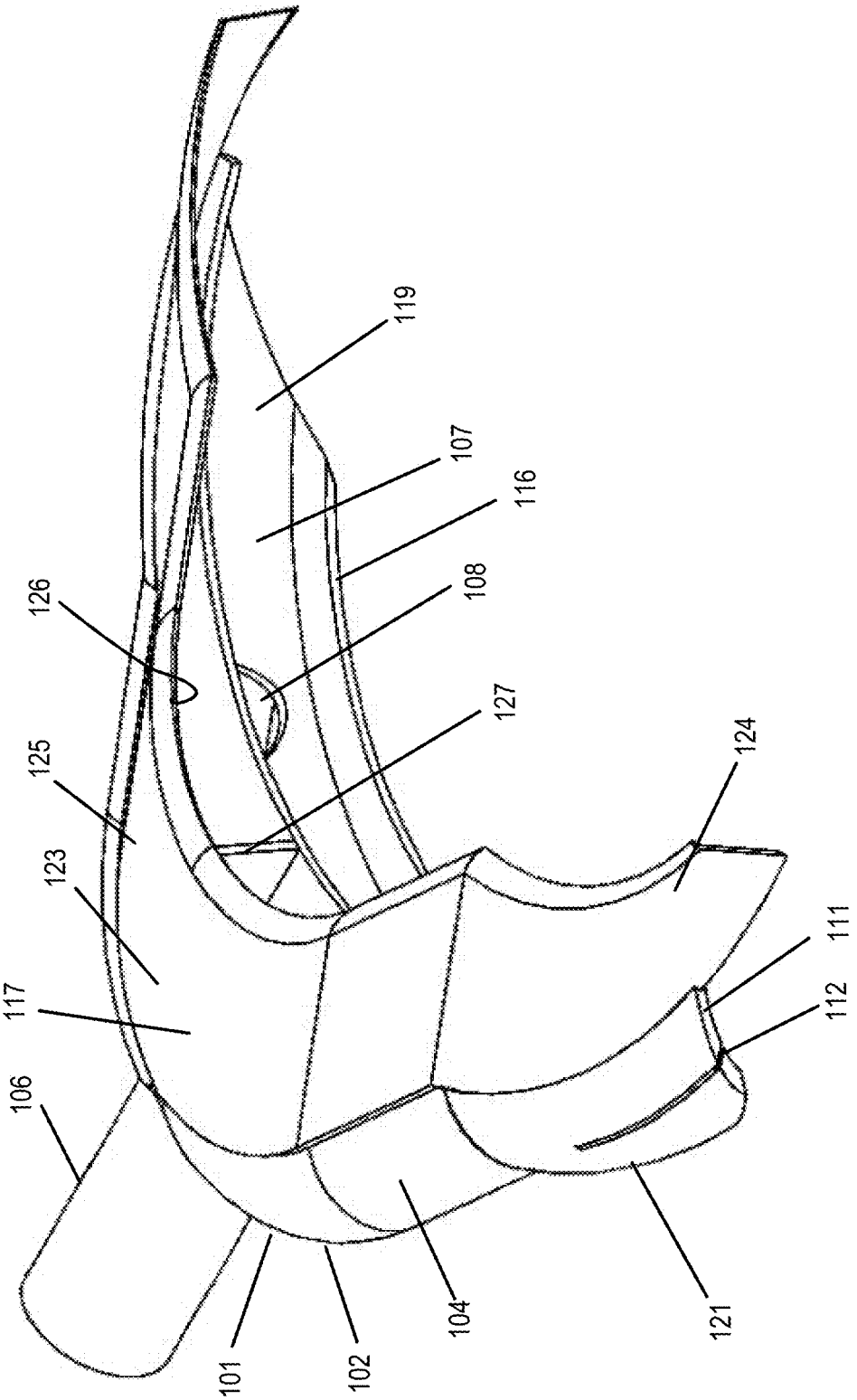
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Fig. 2

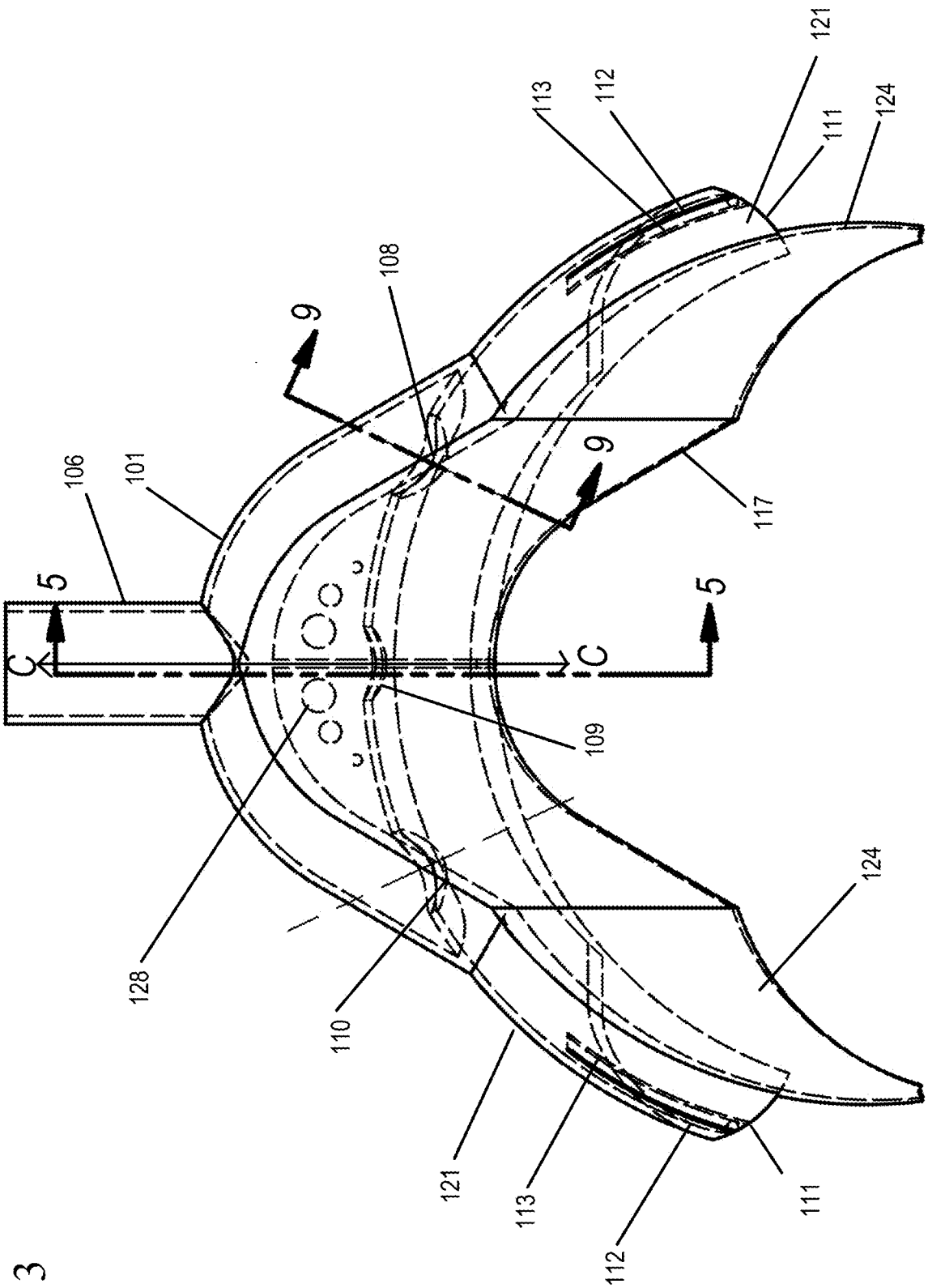
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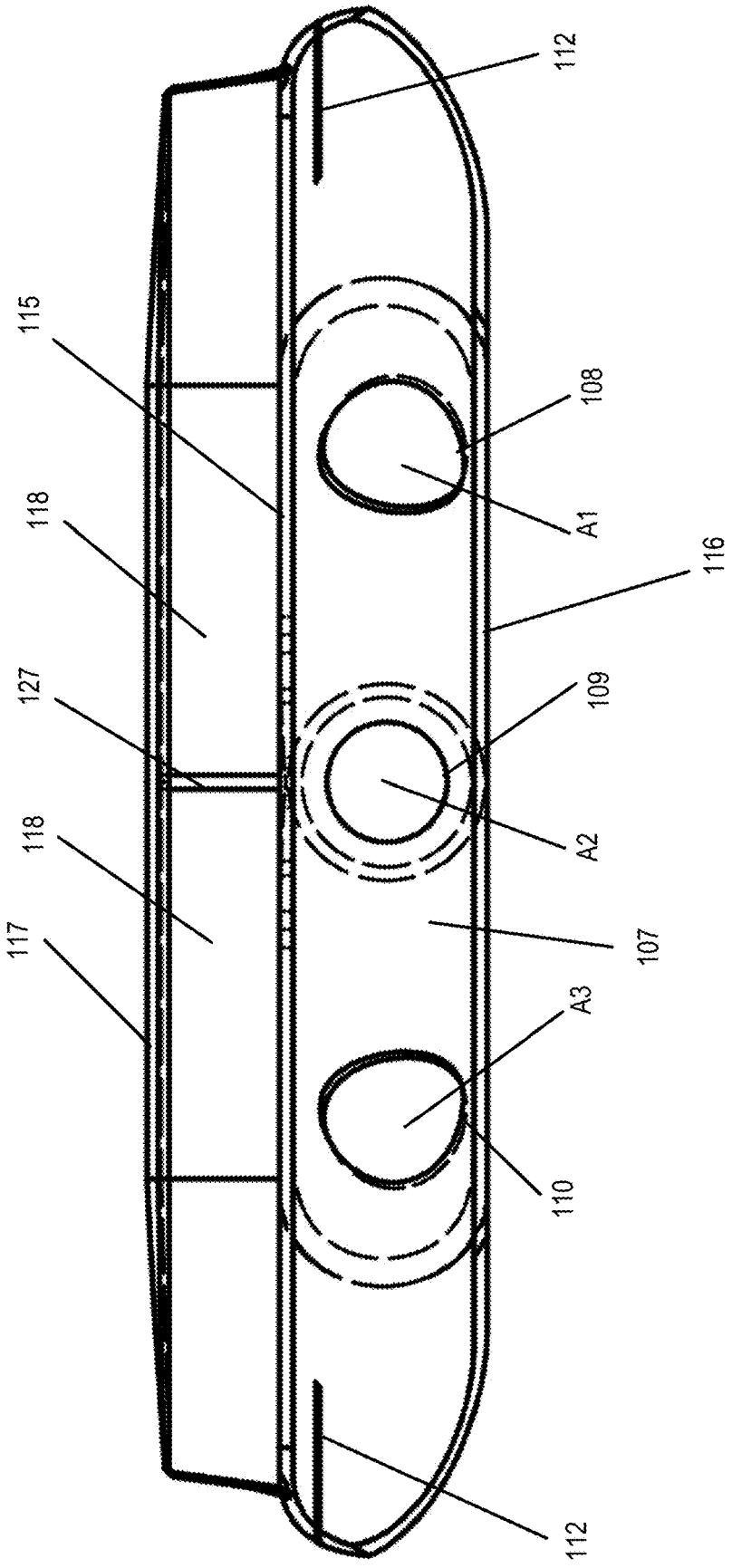
Fig. 3



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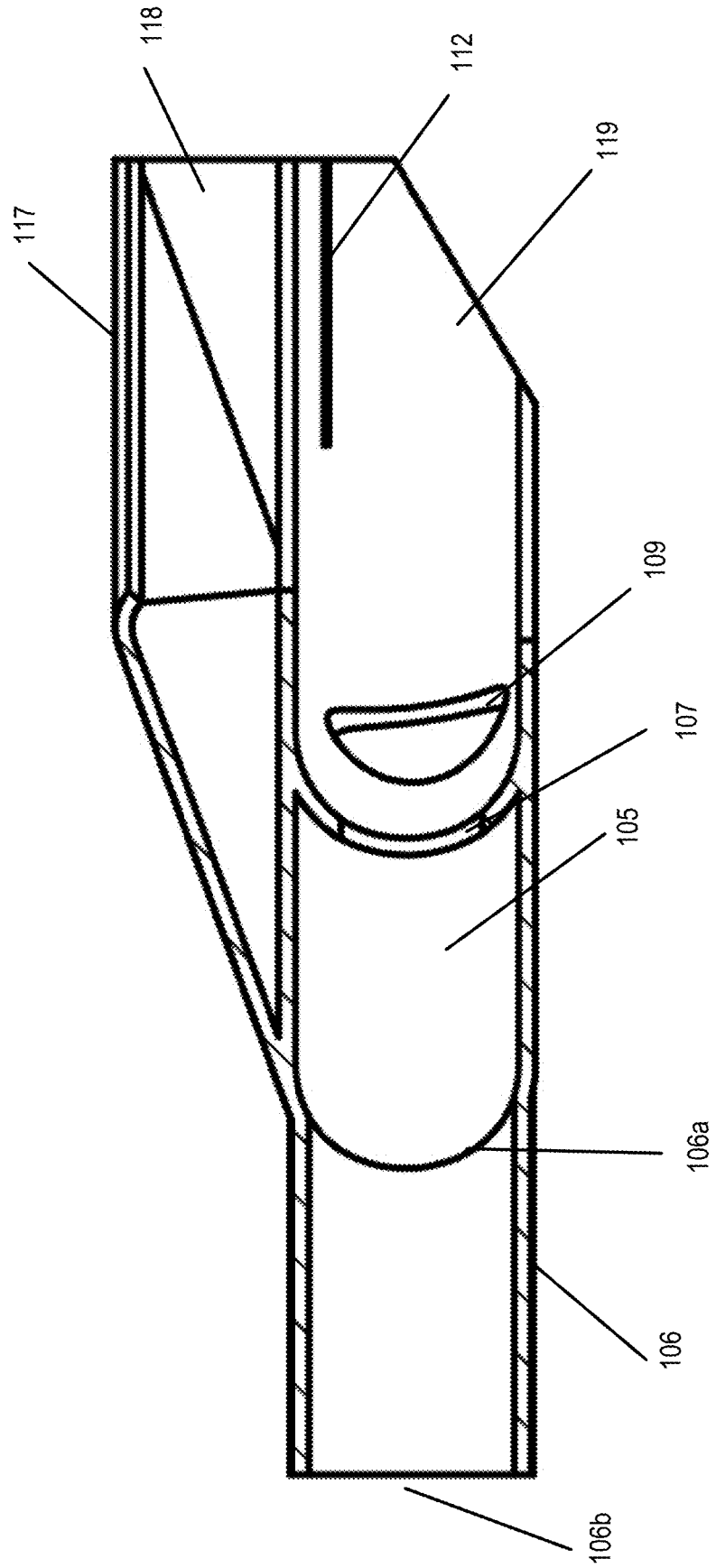
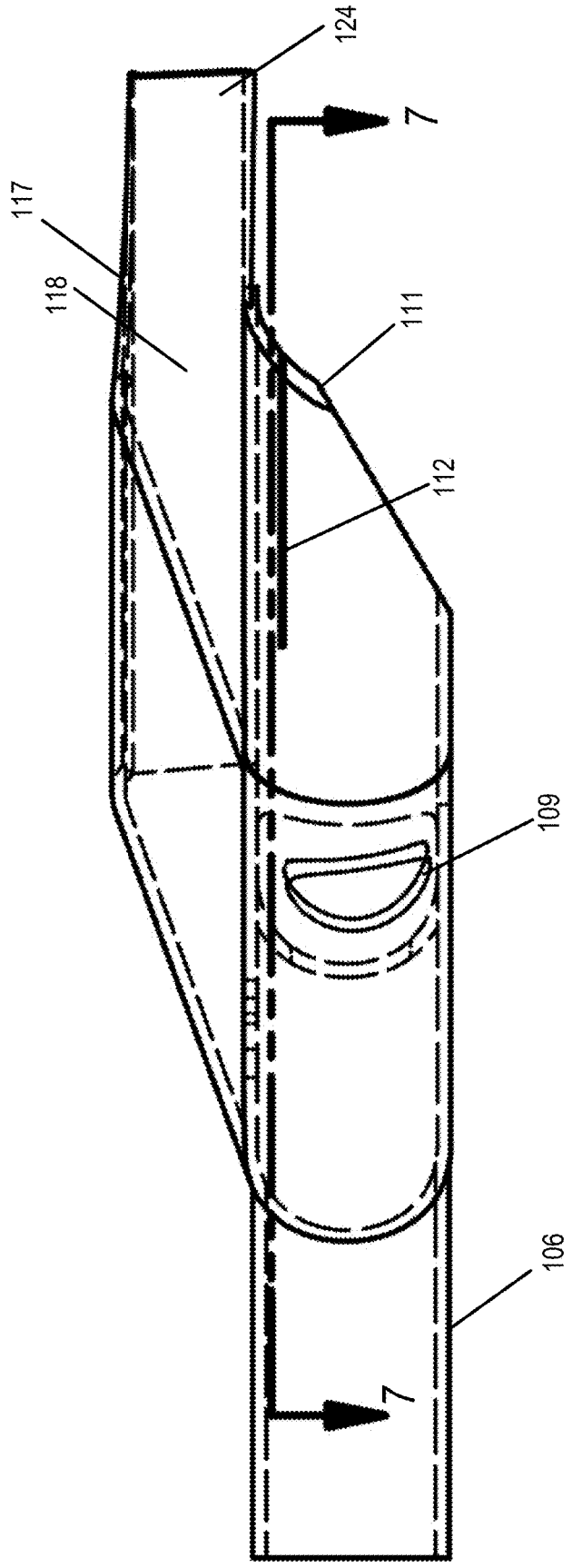


Fig. 5



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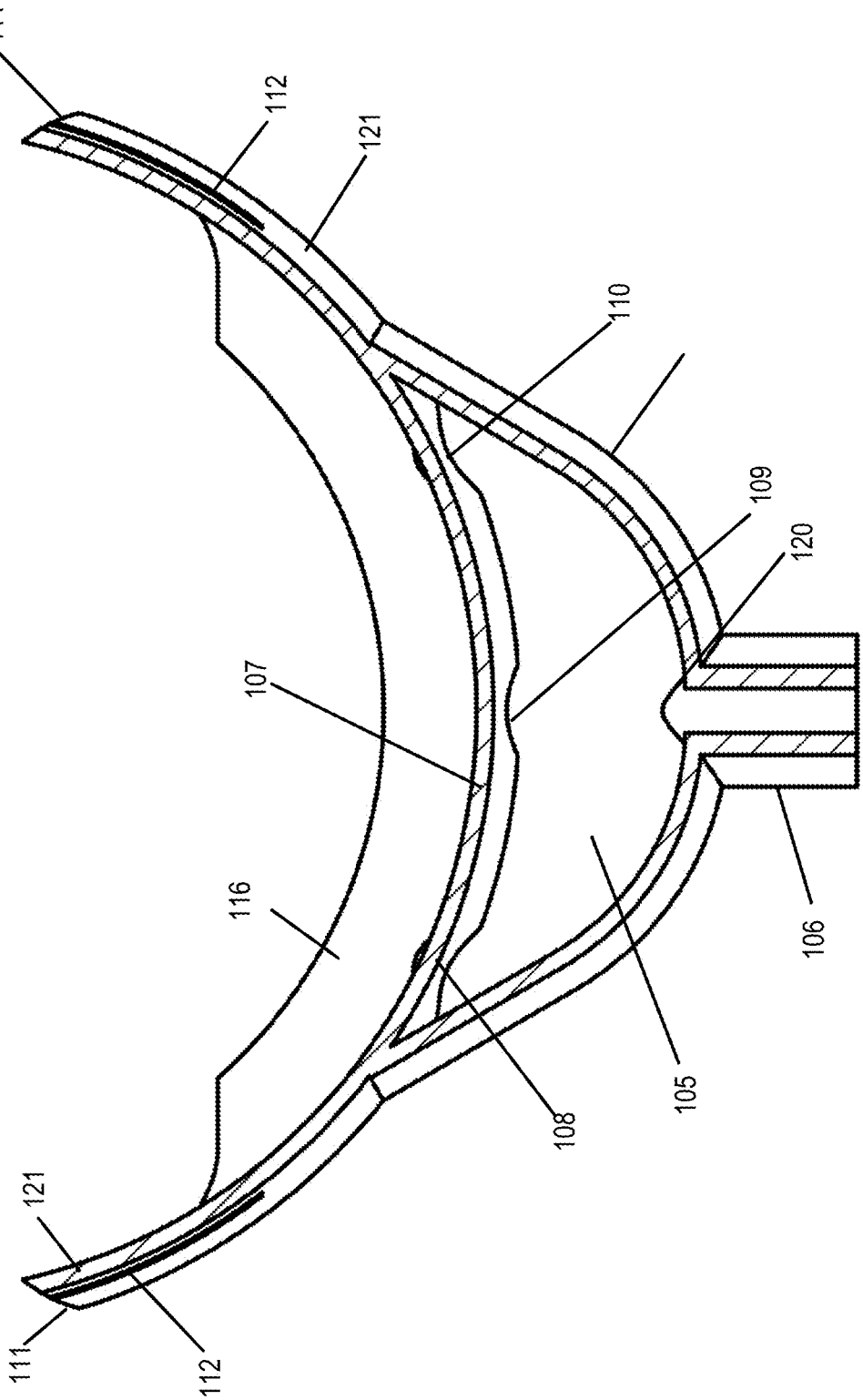
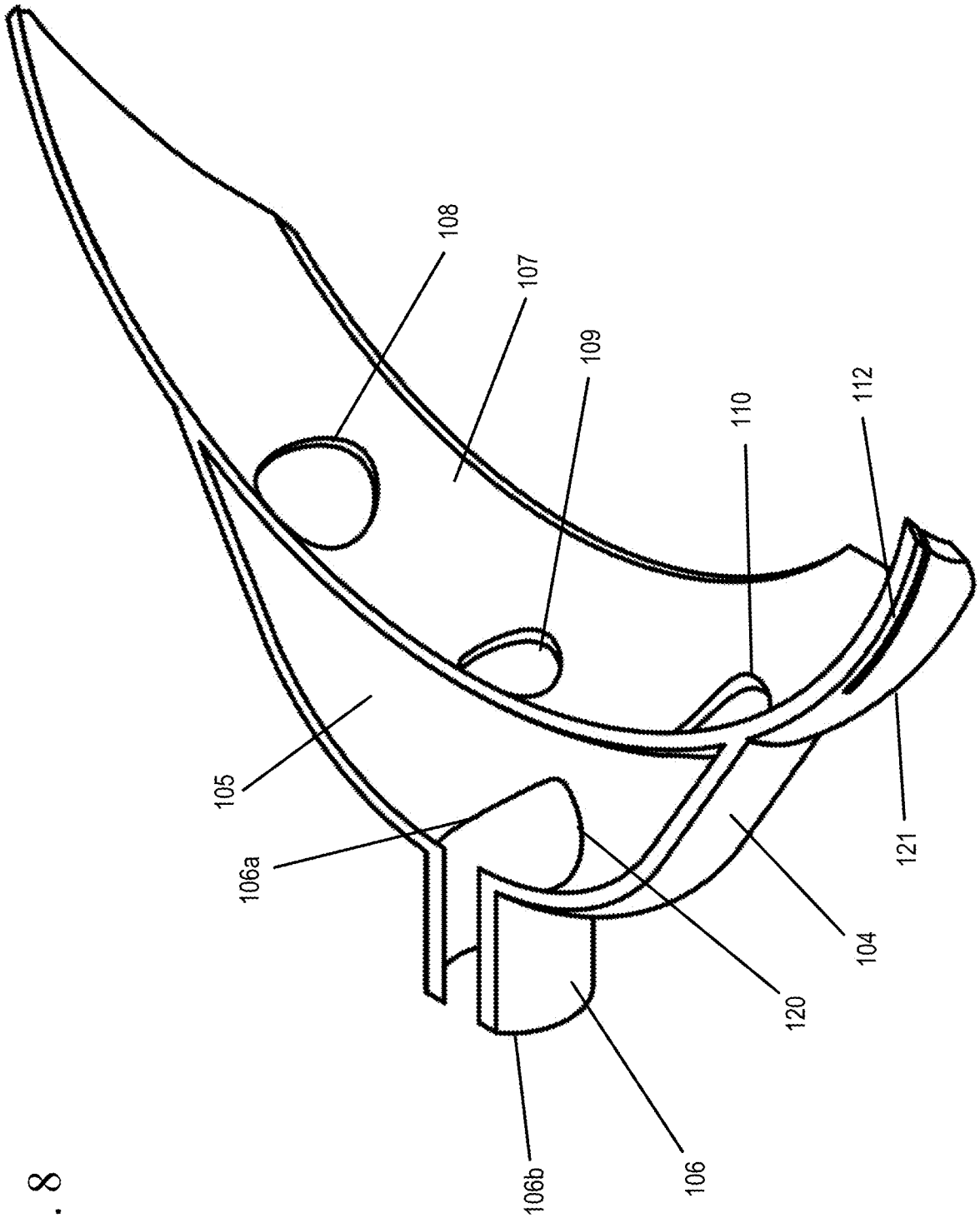


Fig. 7



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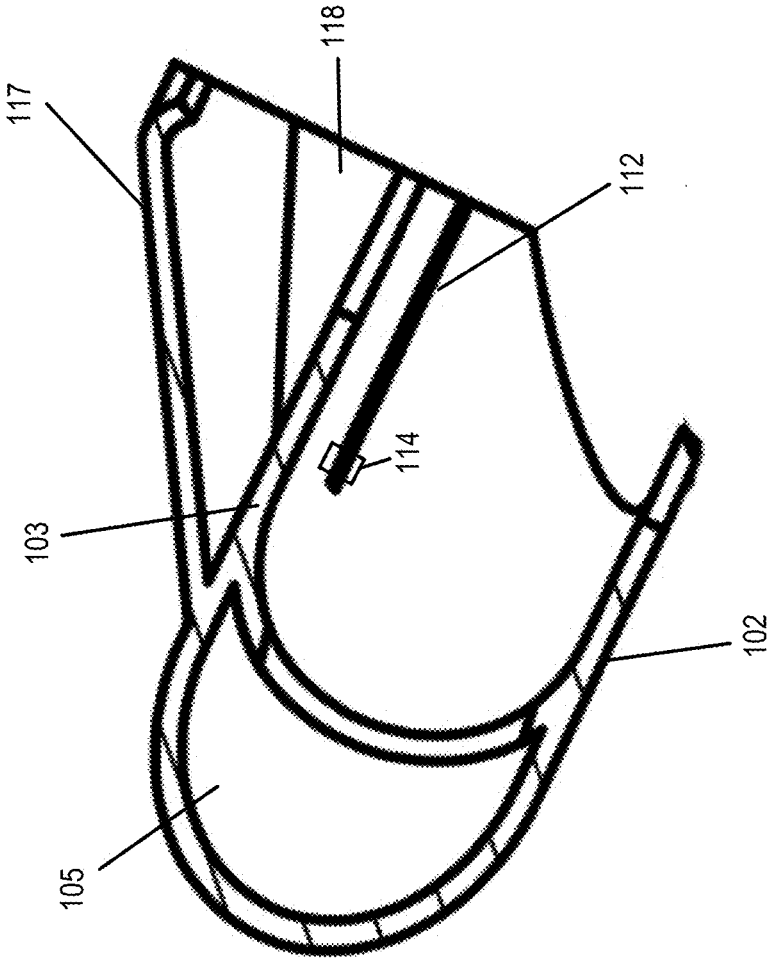

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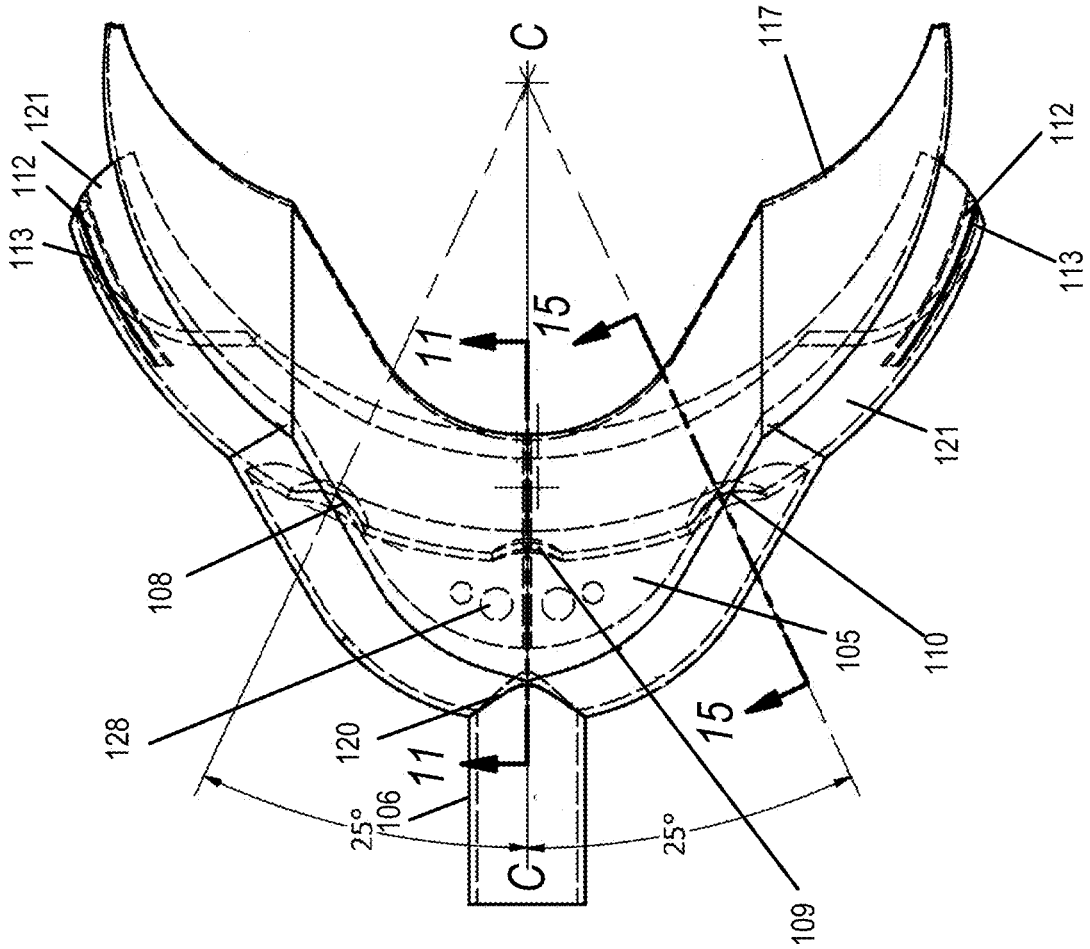
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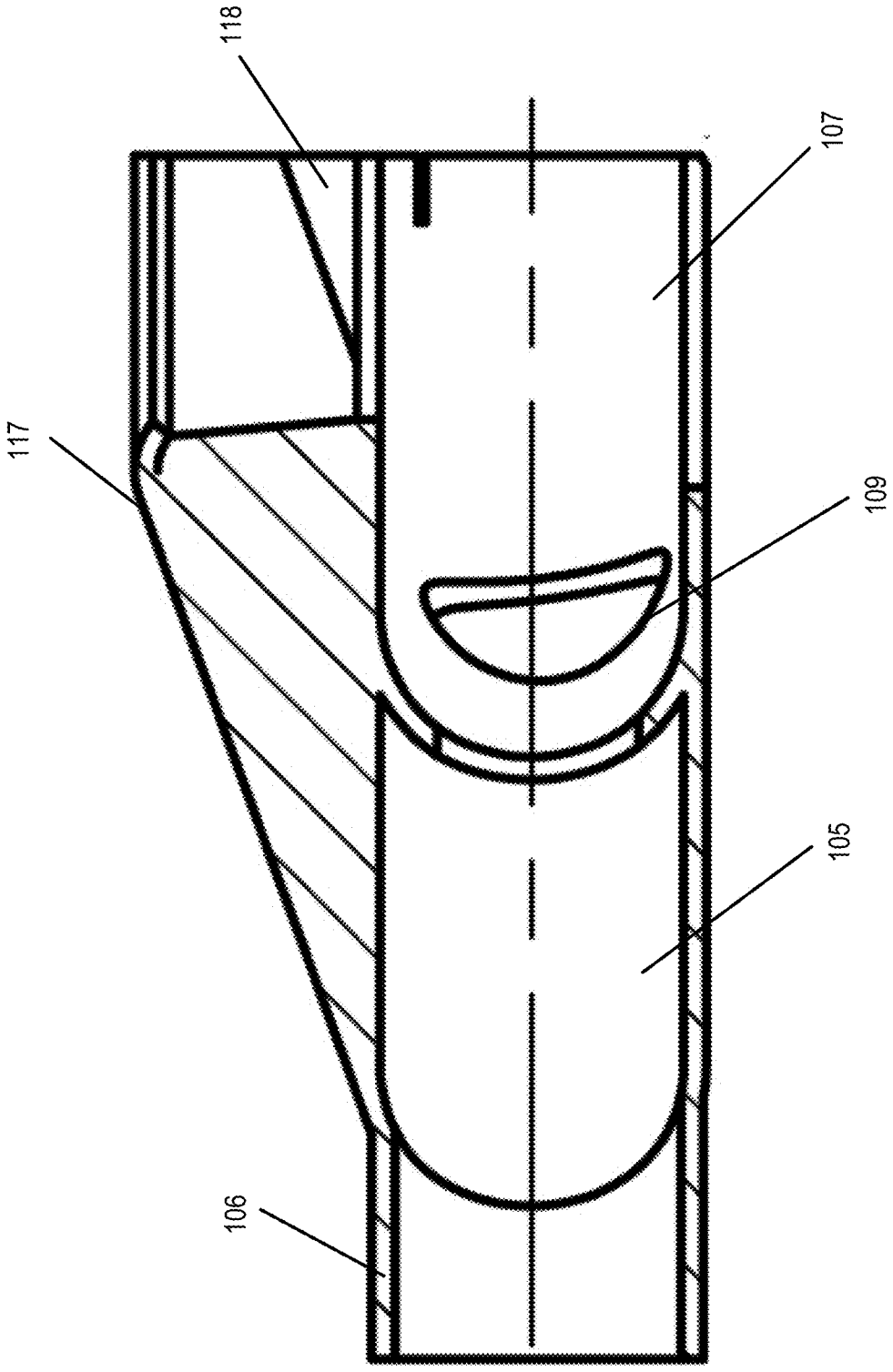
Fig. 10



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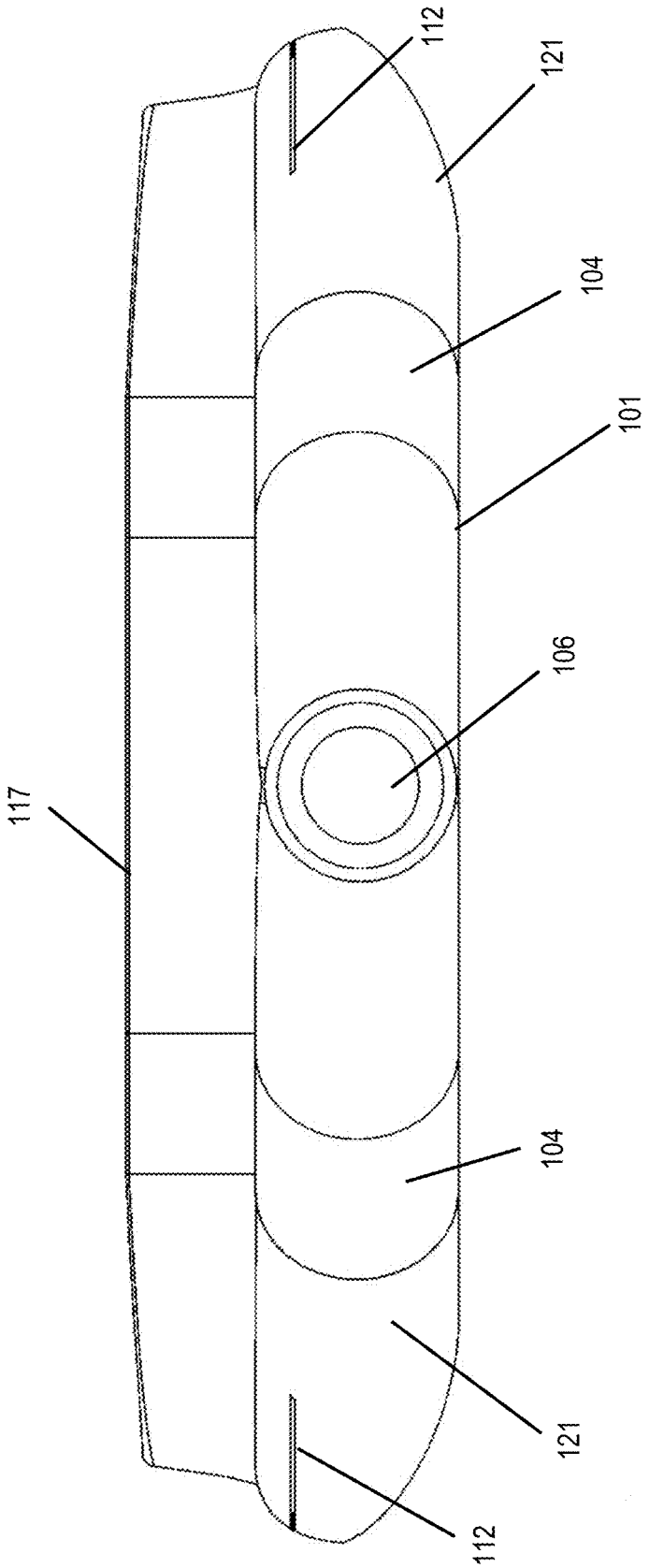

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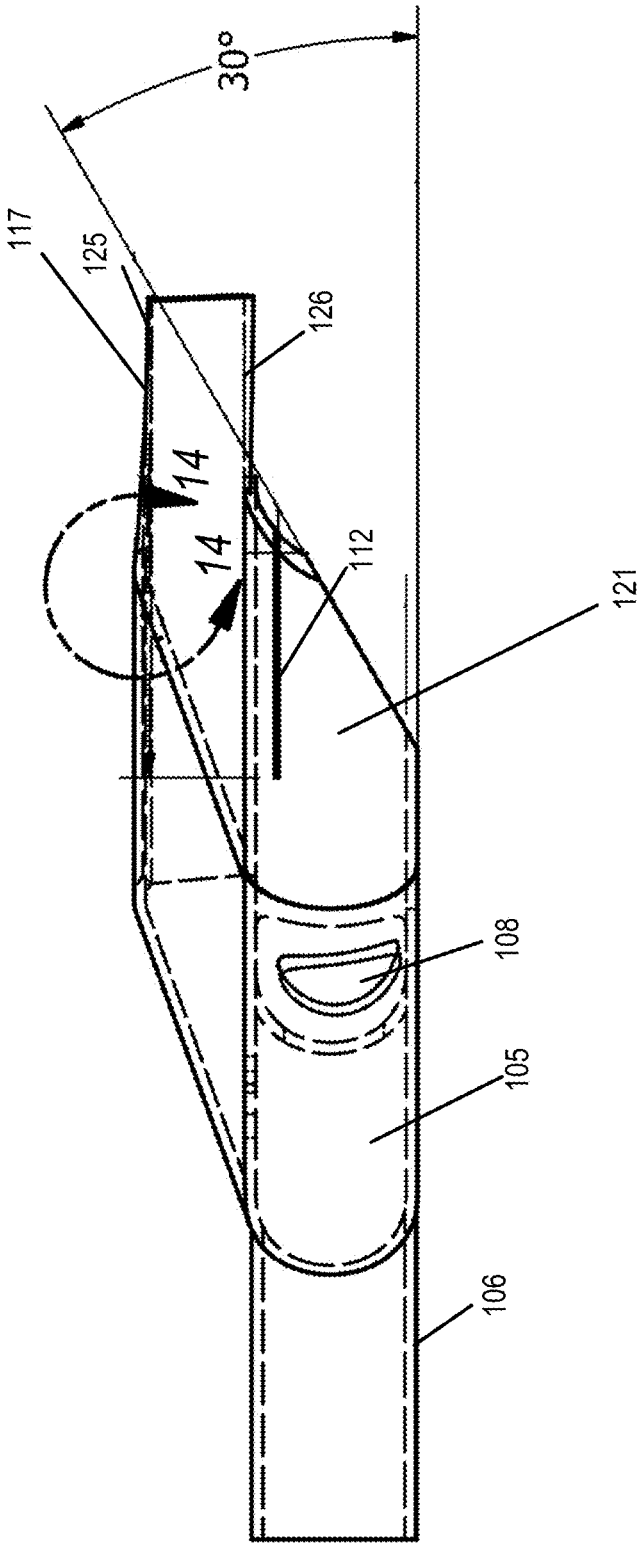

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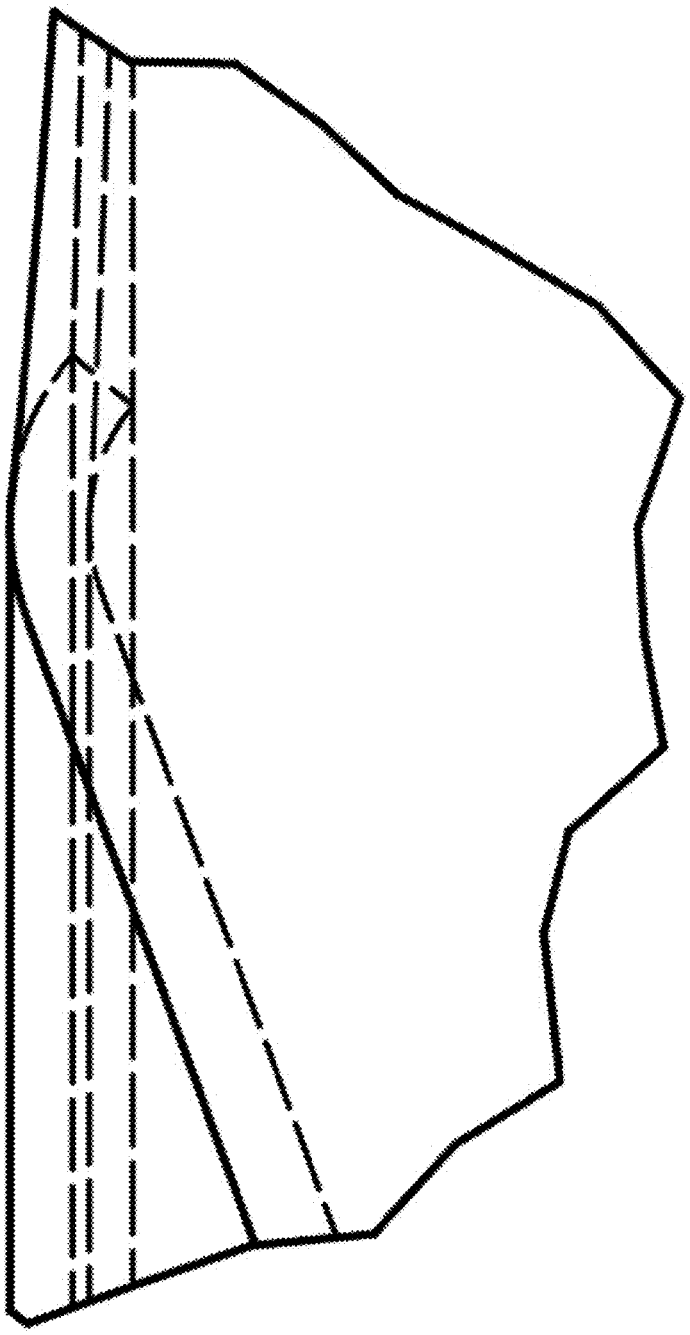

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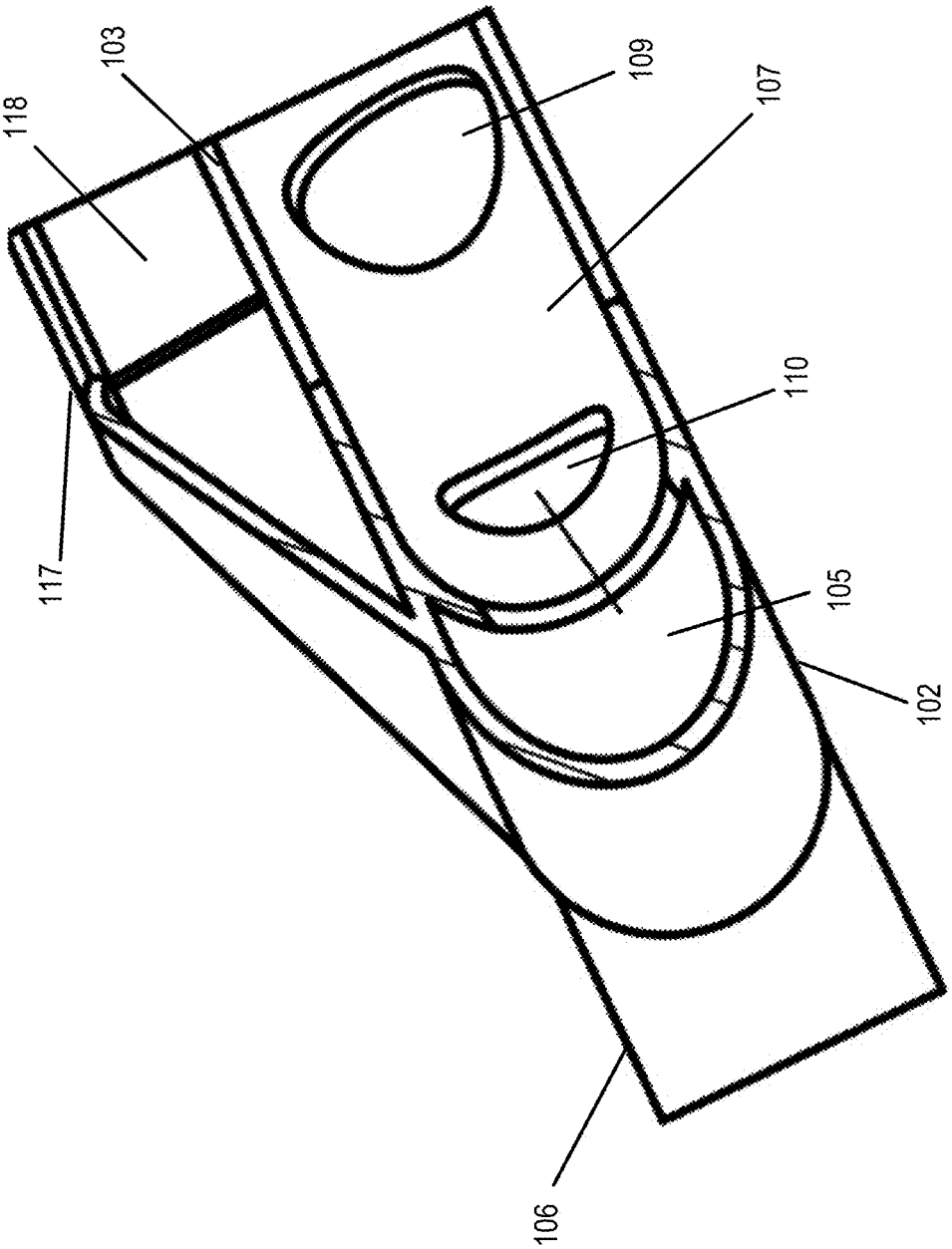

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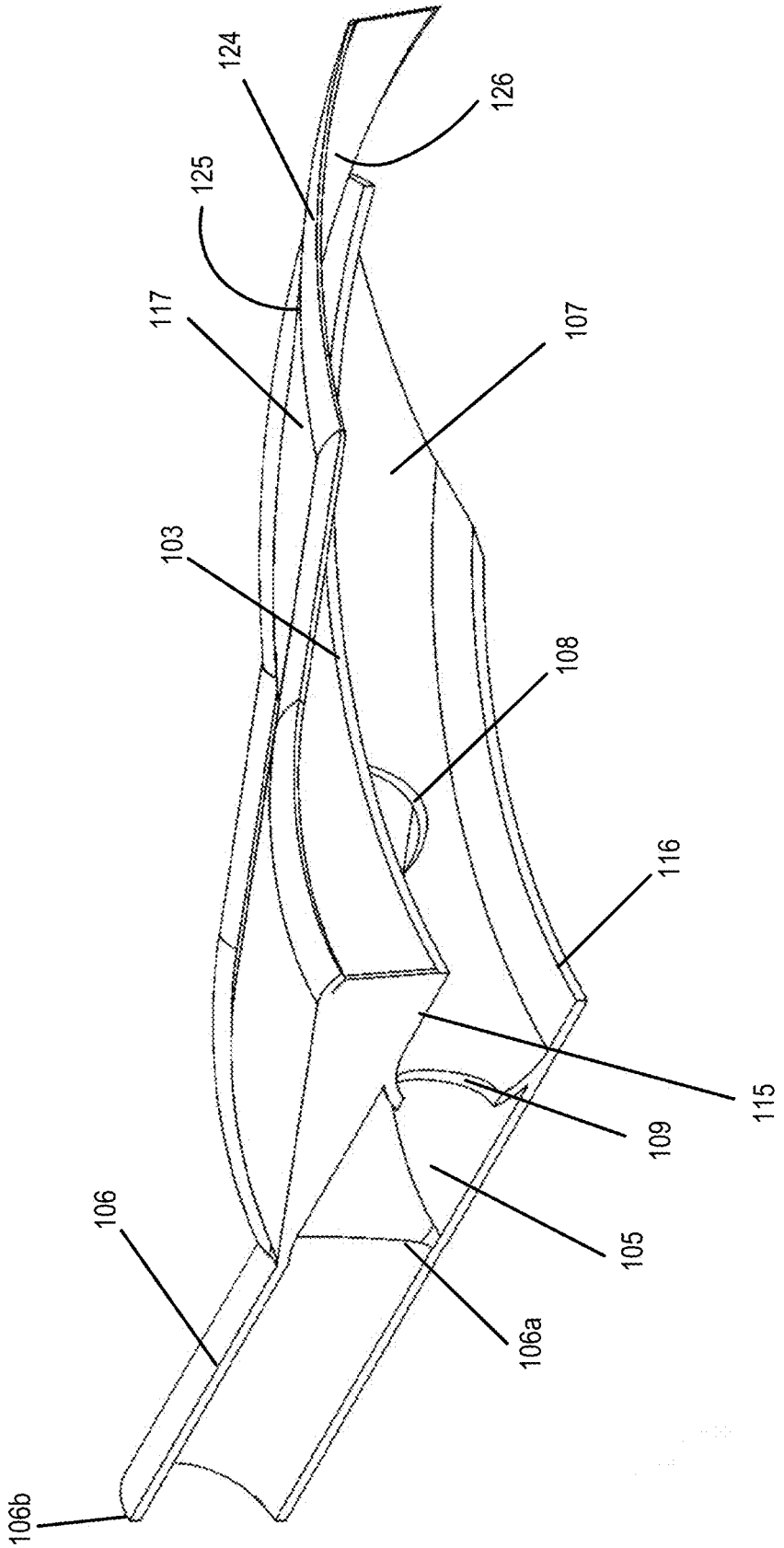

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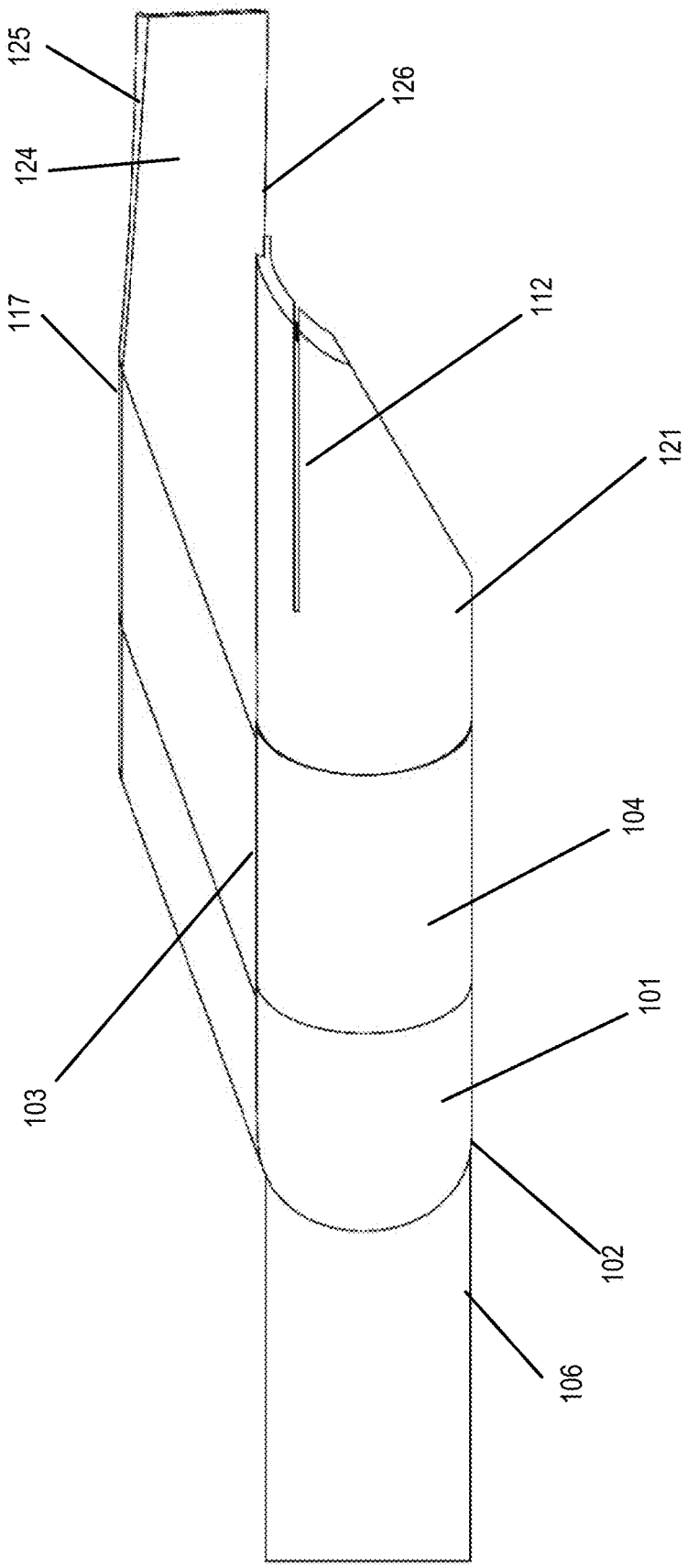

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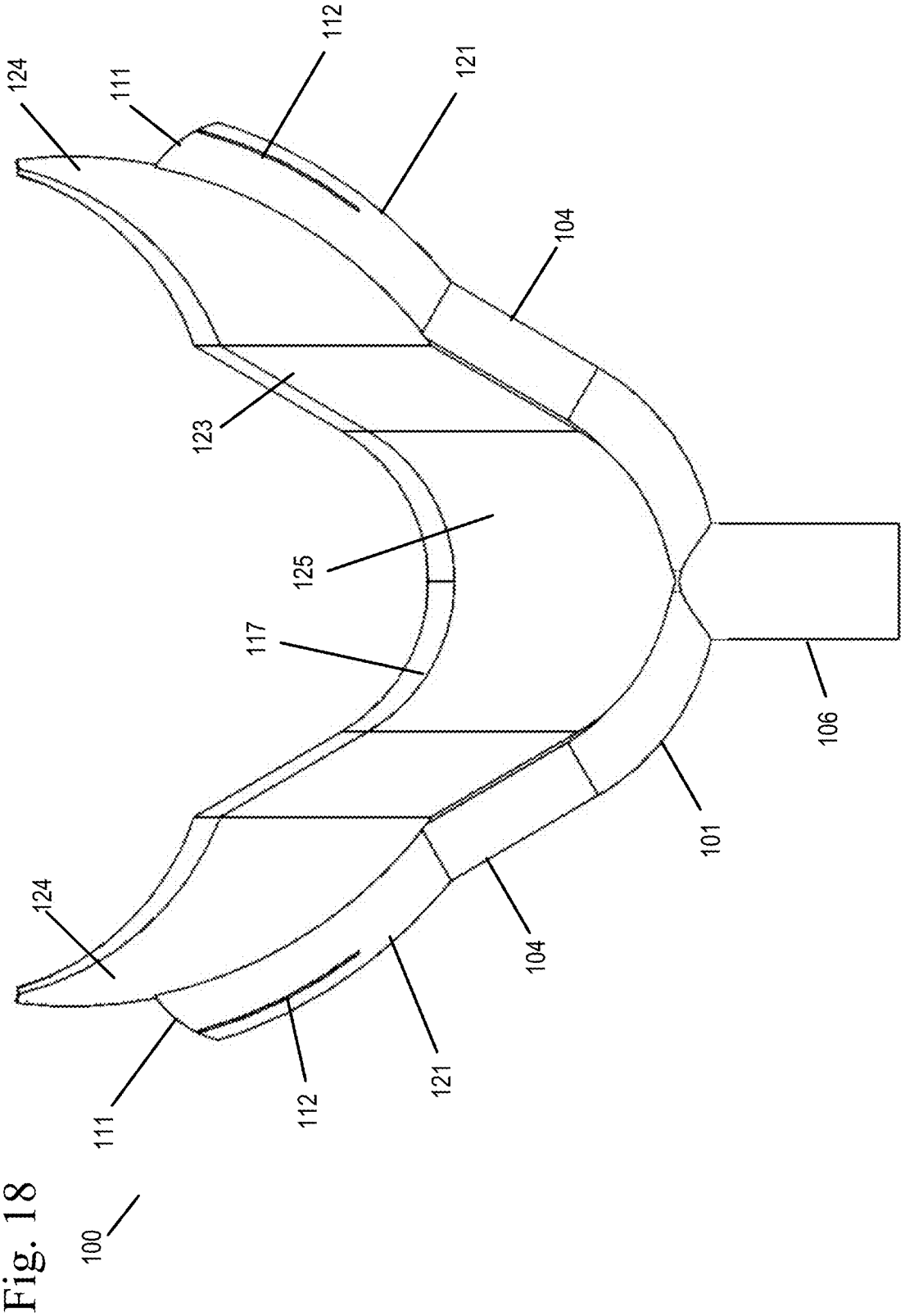

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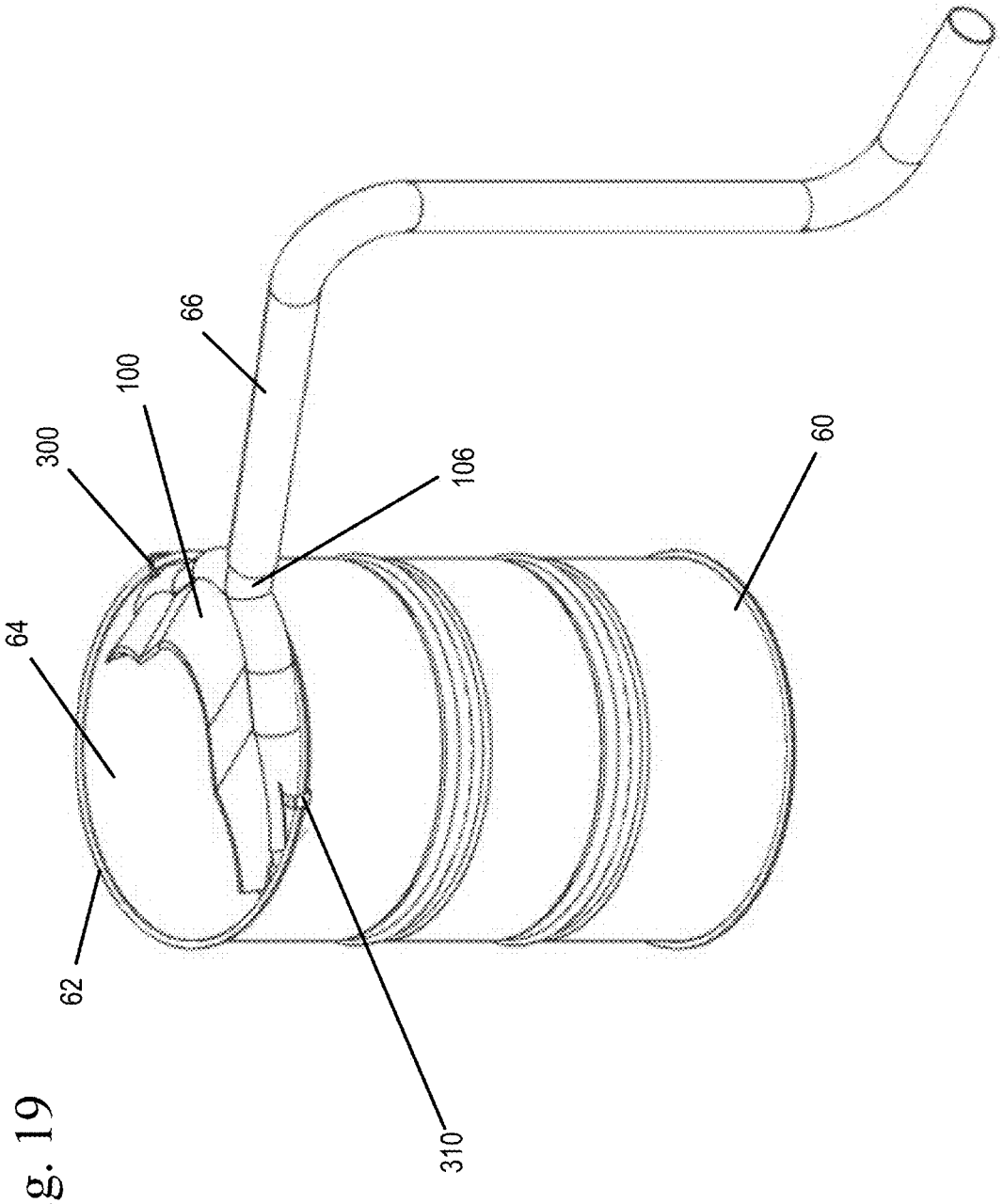

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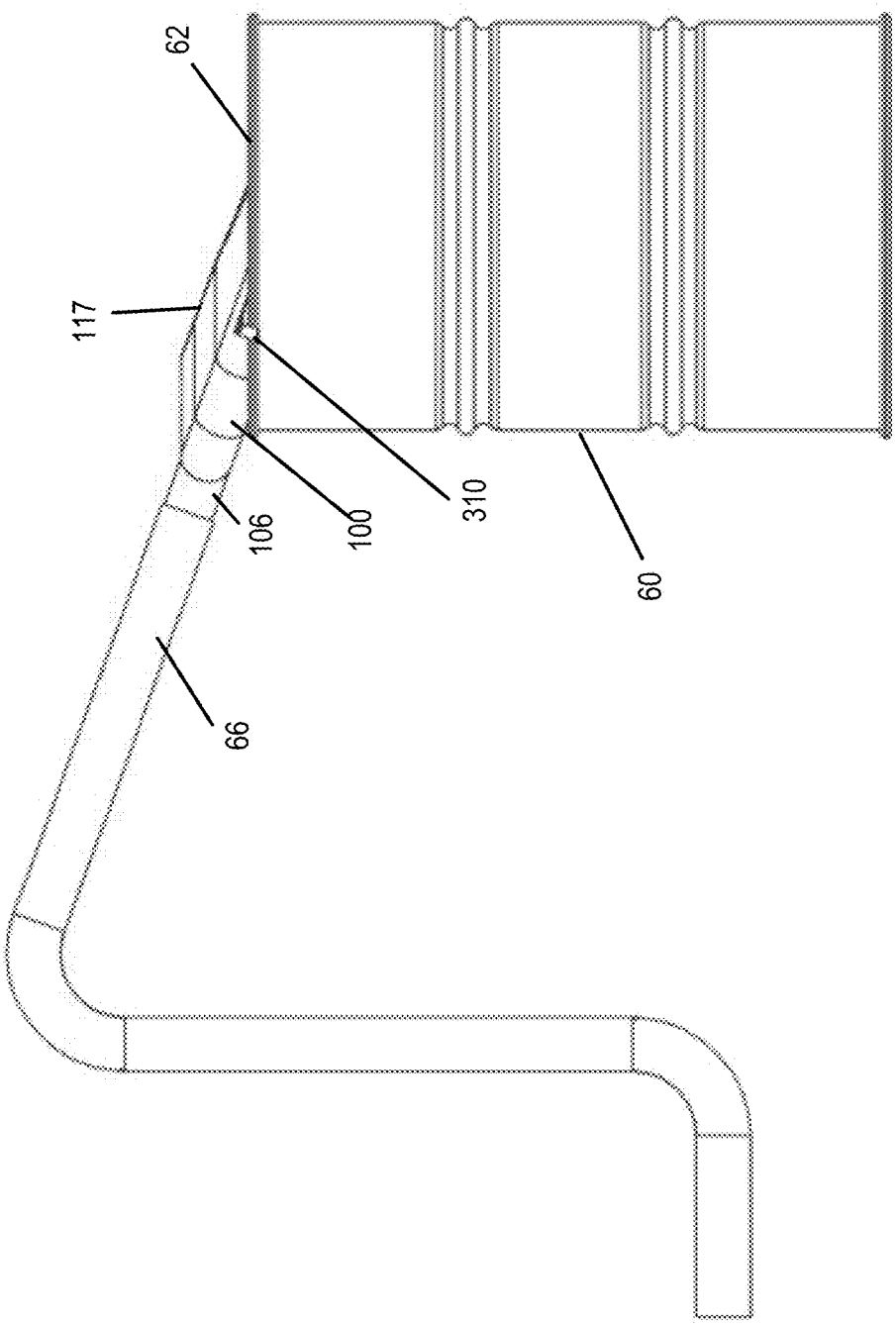

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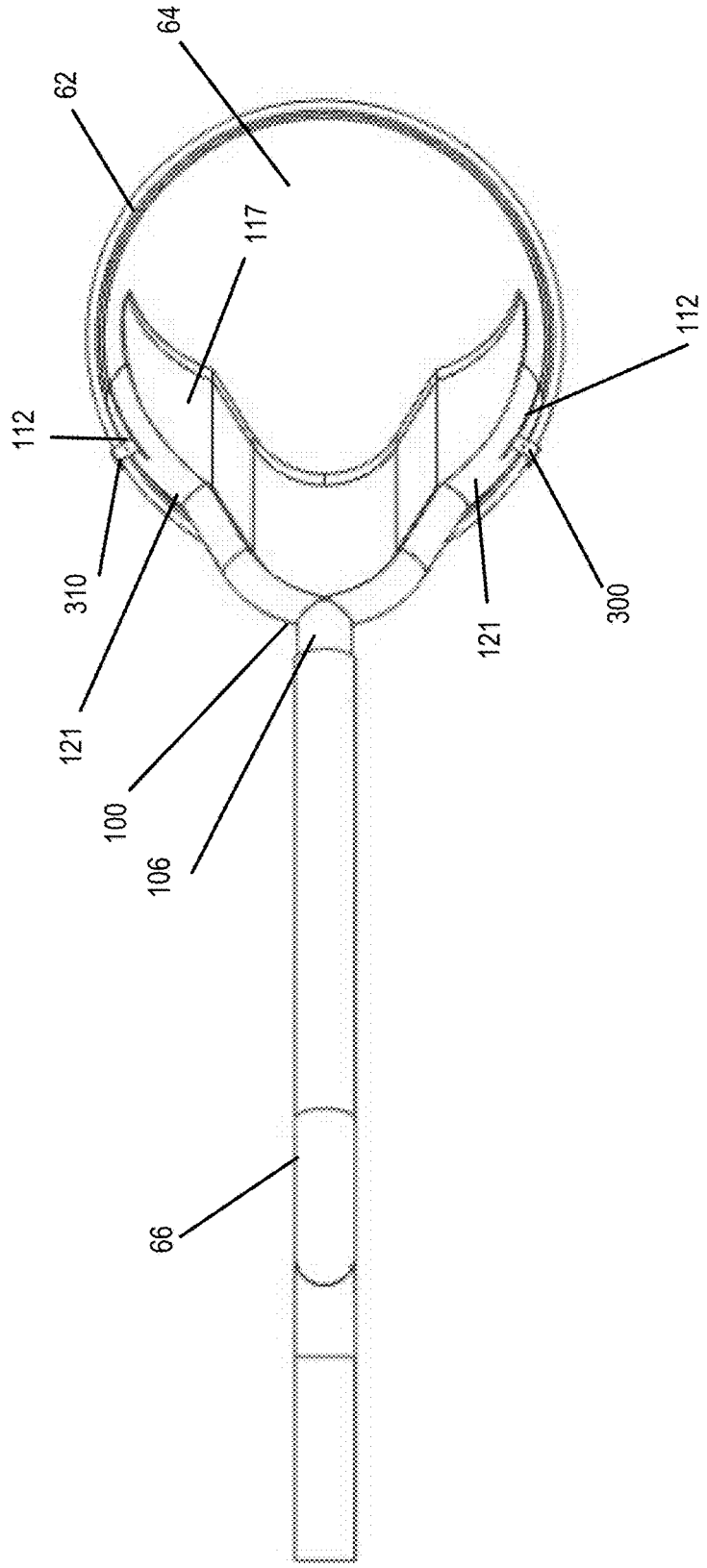

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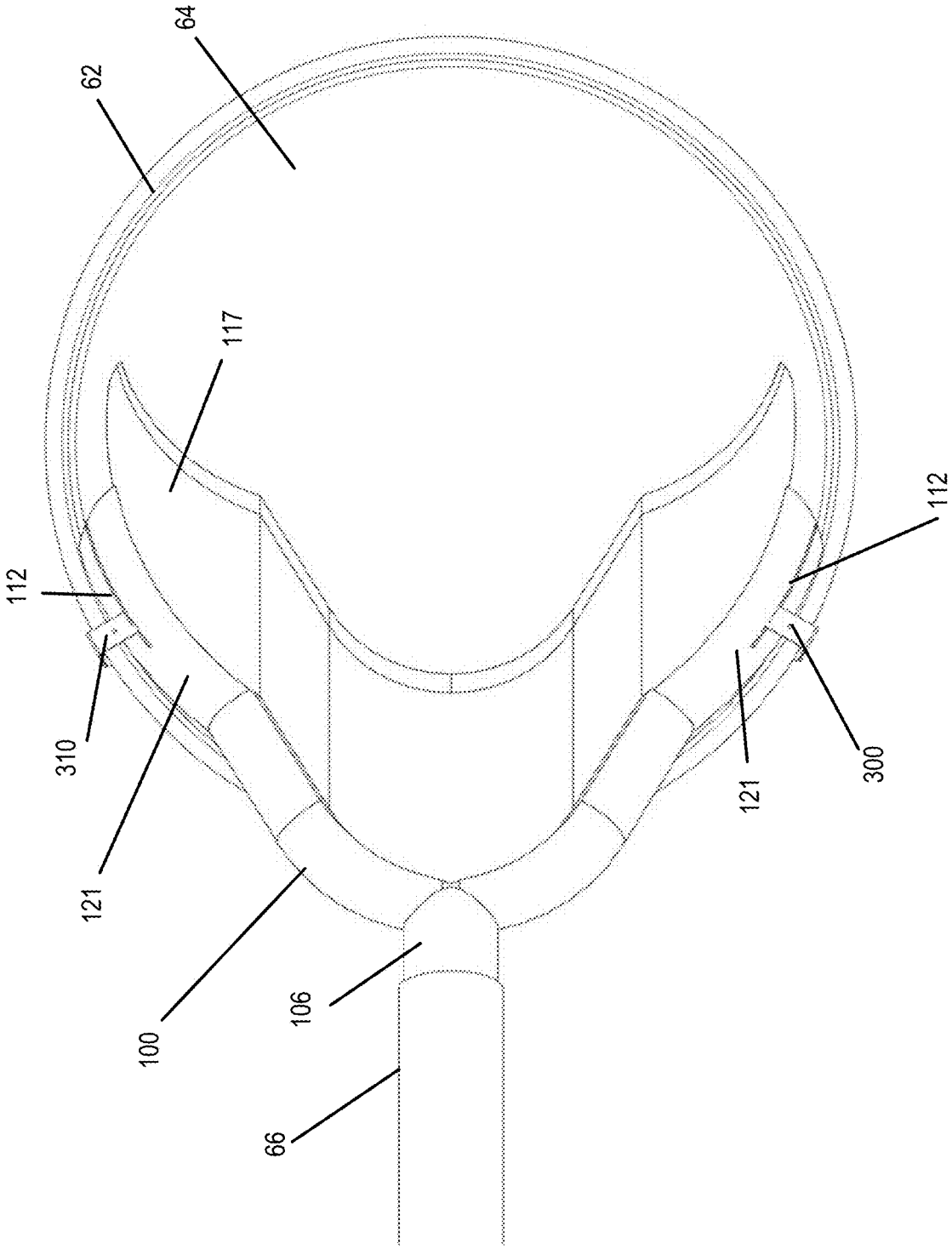

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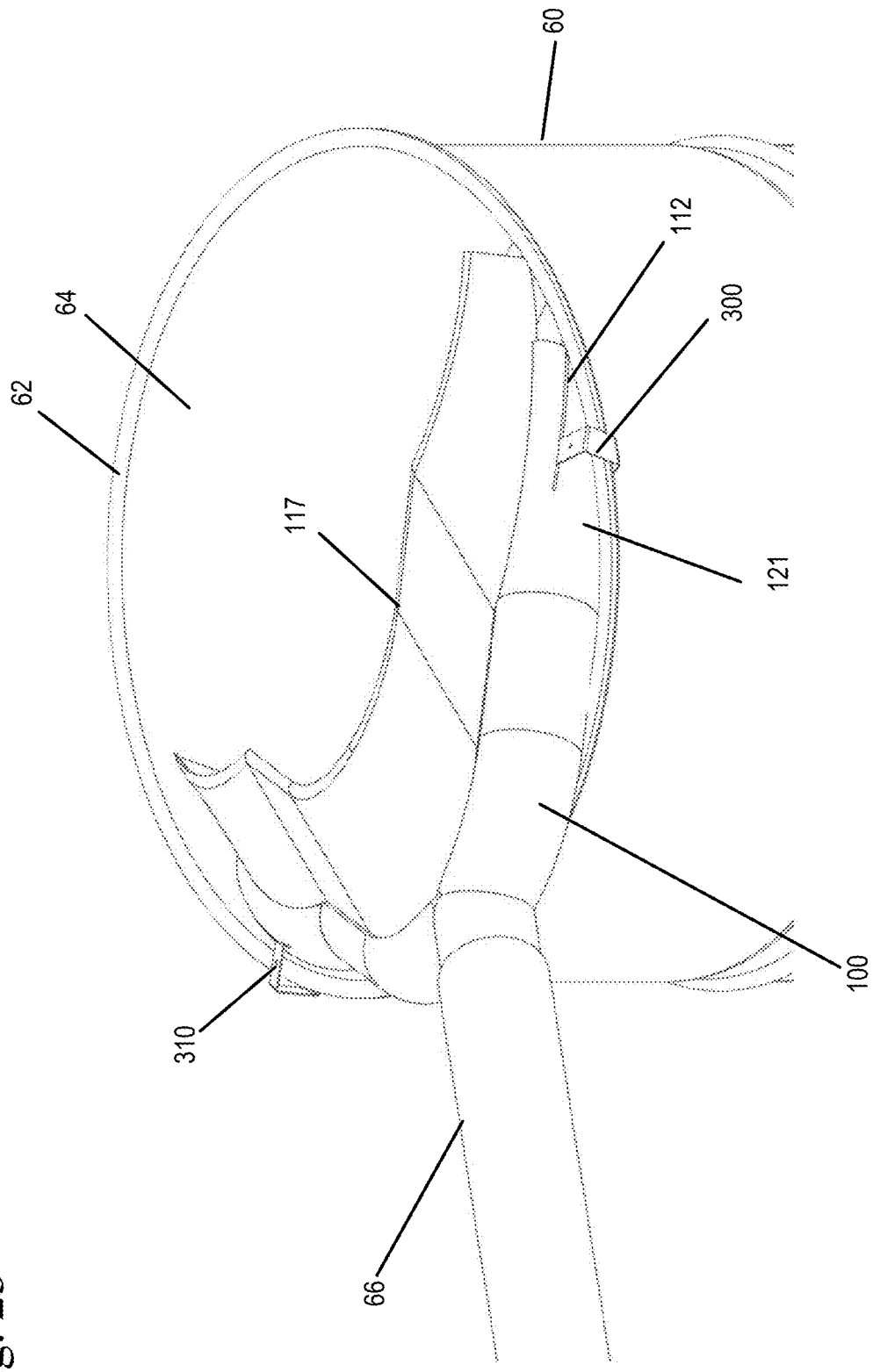

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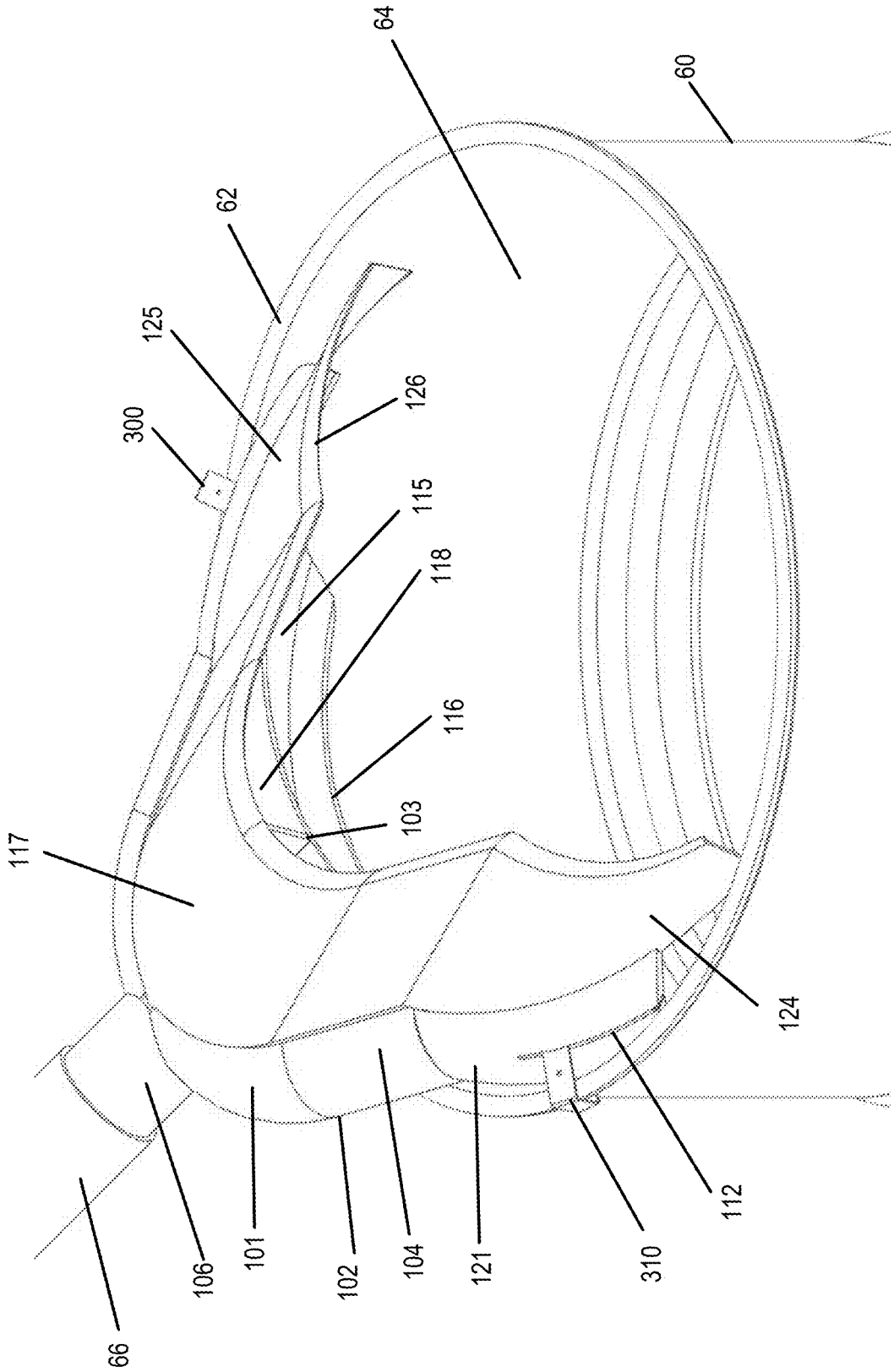
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Fig. 24

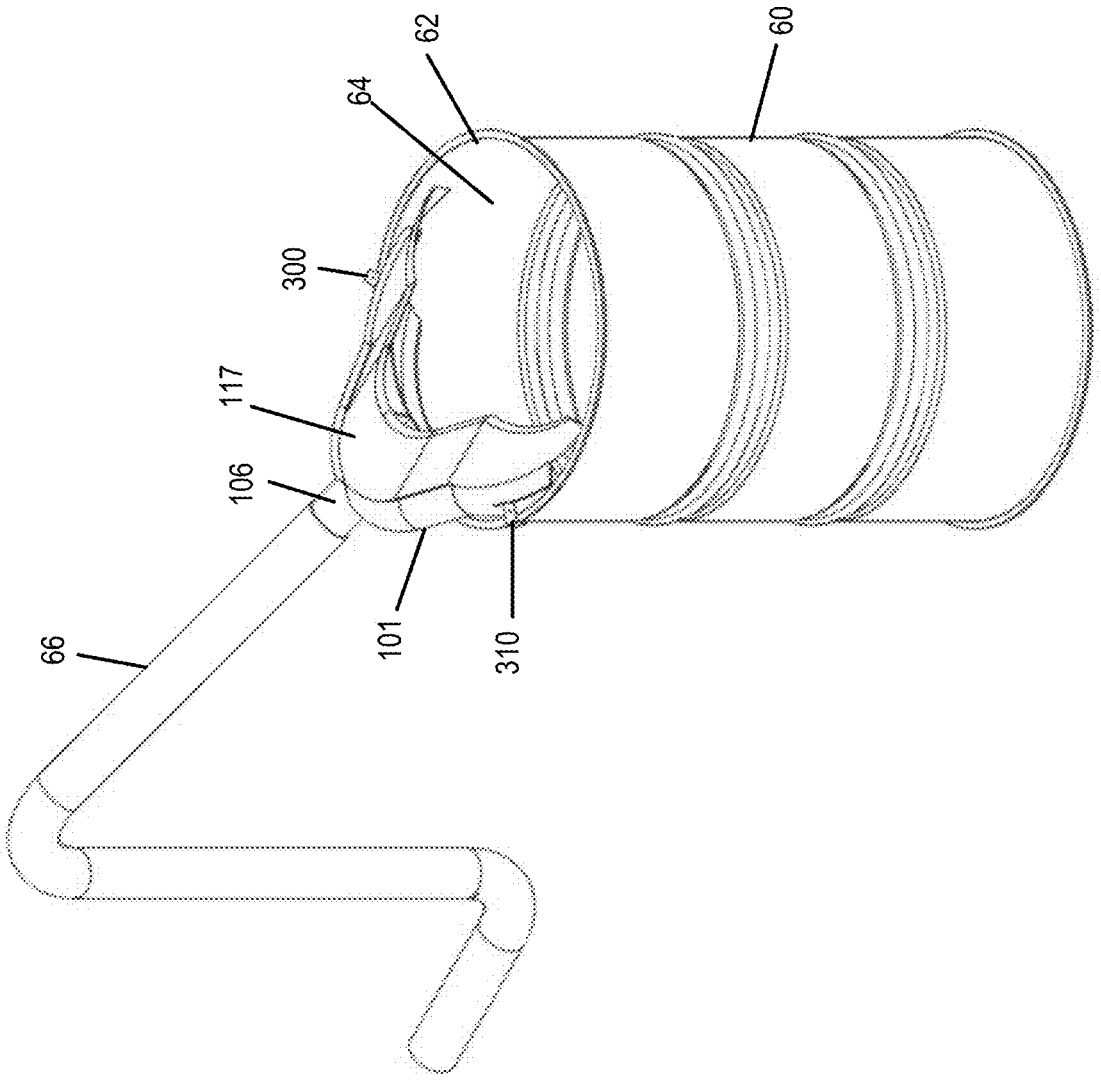


Fig. 25

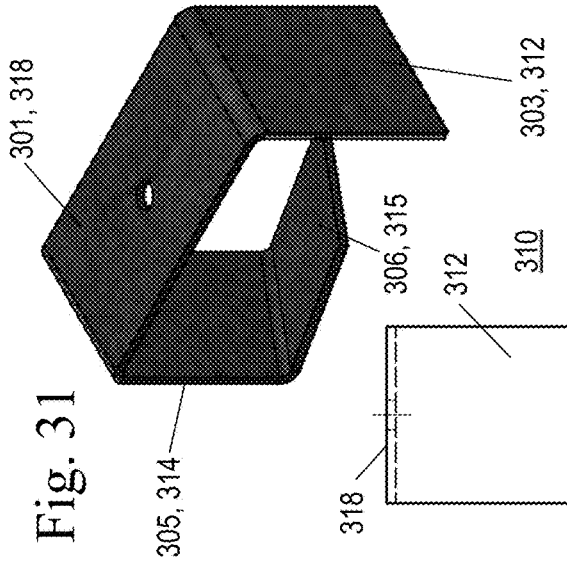
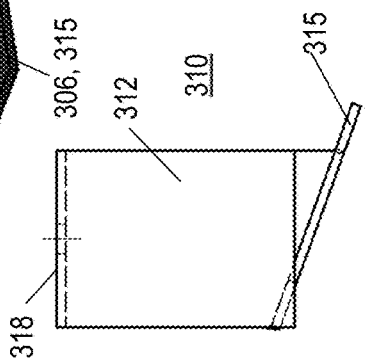


Fig. 31



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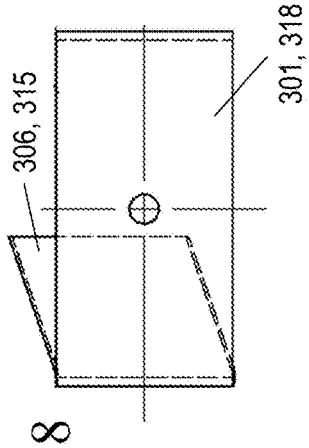


Fig. 28

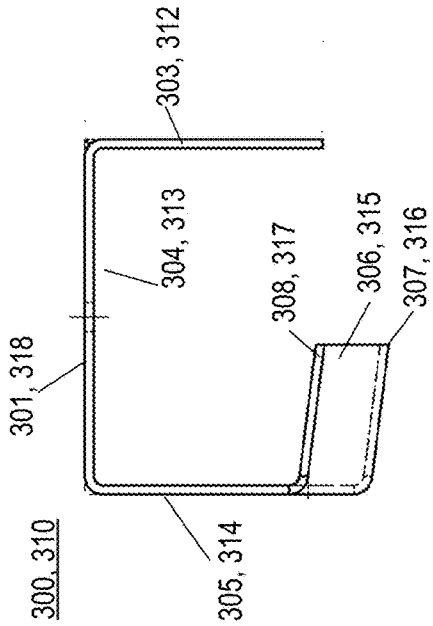


Fig. 29

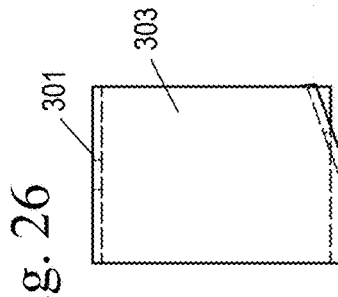
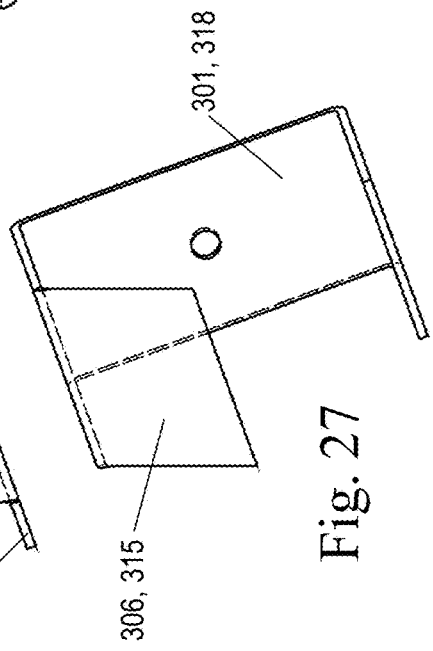


Fig. 26



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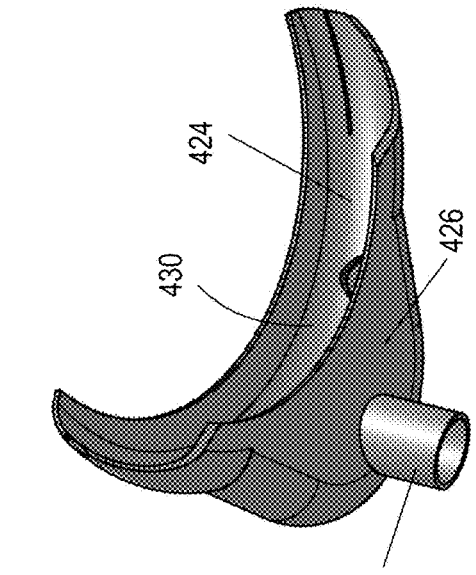
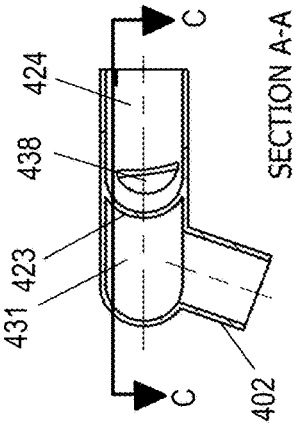


Fig. 35



SECTION A-A
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Fig. 38

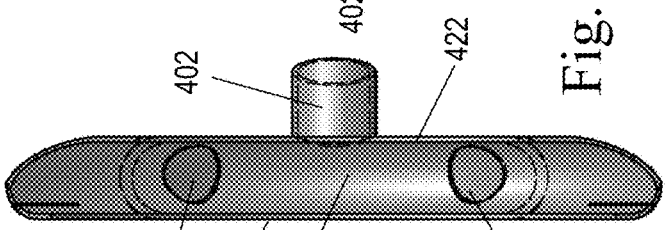
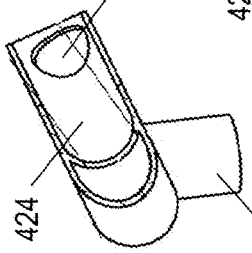
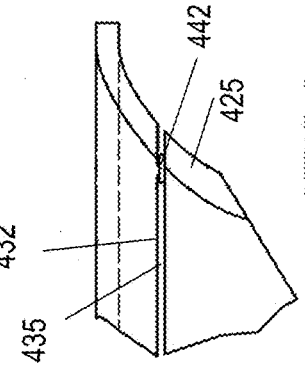


Fig. 34



SECTION D-D
SCALE 1 / 4

Fig. 33



DETAIL B
SCALE 1 : 1

Fig. 37

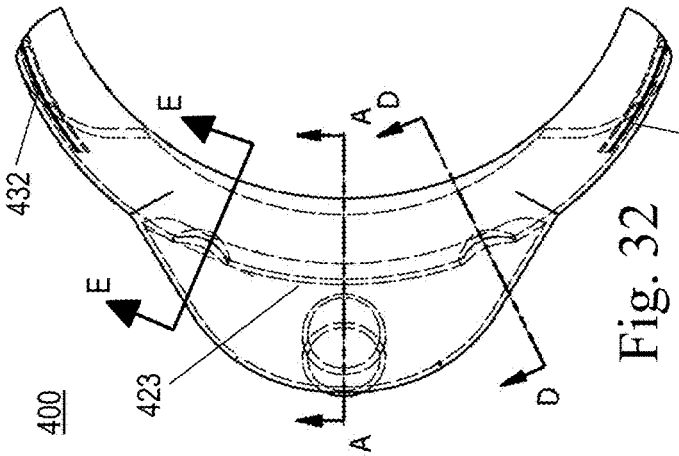


Fig. 32

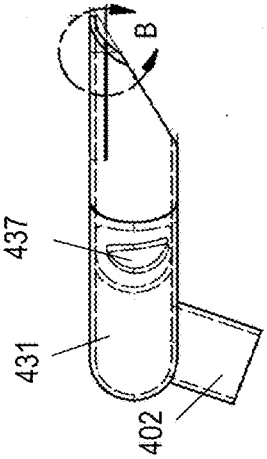


Fig. 36

PARTICULATE COLLECTOR FOR DRUMS

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention pertains to the field of particulate collectors. More particularly, the invention pertains to a particulate collector for drums.

Description of Related Art

[0002] In many facilities, powders are mixed together to form a powdery compound product which are either sold outright or are further processed by mixing the powdery compound with other products. This mixing often needs to occur within a hood or a specialized area within the facility due to the particulates that end up in the air during the mixing of powders. The problems that can arise during the mixing process of powders in large volumes include, when the powder is poured into a container, for example drums, the powder particulates billow out and create a mess. The powder particulates can also be harmful if breathed in by users preparing the powdery compounds. Additionally, when the powders or the powdery compound are mixed together, additional particulates are created during the process.

[0003] FIGS. **32-38** show a conventional particulate collector **400** of U.S. Published Application No. 2014/0115821. The particulate collector **400** has a crescent shaped body with curved outer ends **425**, an outer surface **423** and an inner surface **424**, vacuum ports **437**, **438** extend from the outer surface **423** to the inner surface **424**, and a collection chamber **431** formed adjacent the outer surface **423**. A hollow pipe **402** with an outer end is connected to an opening **401** in the collection chamber **431**. The hollow pipe **402** is connected to a bottom of the **426** of the collection chamber **431**. The hollow pipe **402** is preferably at a 20 degree angle relative to the bottom **426** of the collection chamber **431**. The collection chamber **431** is connected to an inner chamber **430** through the vacuum ports **437**, **438**.

[0004] The inner chamber **430** of the particulate collector **400** is defined between an upper protruding rim **421**, an inner surface **424**, and a lower protruding rim **422**. The upper protruding rim **421** and the lower protruding rim **422** are semicircular shaped and preferably corresponds to the shape of an outer lip along the rim of a drum with the back end of the particulate collector extending out from the drum. Vacuum ports **437**, **438** allow air to flow from the inner chamber **430** and into the collection chamber **431**. The outer ends **425** of the particulate collector **400** are curved outward to aid in maintaining contact between the drum **60** and the particulate collector **400** through friction. At opposing ends of the particulate collector **400** are slots **432**, **434**. The slots **432**, **434** define an opening **435**, **436** to allow movement of clips within the slots **432**, **434**.

[0005] Some of the disadvantages associated with the conventional particulate collector are the angle of the pipe **402** relative to the collection chamber **431** limits the airflow and does not capture the particulates in the drum.

SUMMARY OF THE INVENTION

[0006] A particulate collector for attachment to a vacuum cleaner and for preventing particulates from spilling over a top of an opening defined by a rim with an outer lip during mixing of material in a drum. The collector comprises a body, a hollow pipe for connection to the body and vacuum hose and a funnel shield. The body of the particulate collector has opposing curved ends, a top portion extending to an upper rim and a bottom portion extended to a lower rim, and an inner wall surface having at least three ports. The top portion, bottom portion and inner wall surface define a first chamber and the lower rim, upper rim and inner wall surface define a second chamber, with the first chamber being connected to the second chamber through the at least three ports of the inner wall surface. The hollow pipe has a tubular body with an outer end for attachment to a vacuum cleaner and an inner end mounted to the body, in communication with the first chamber via a port. The funnel shield is mounted to the top portion of the body, extending beyond the upper rim and the lower rim of the body, the funnel shield having a funnel body with a top surface, a bottom surface, and curved outer ends, the bottom surface of the funnel shield body and the top surface of the body defining at least one angled passage.

[0007] When the body of the particulate collector is placed in the opening of the drum and rests on the rim of the opening, with a vacuum cleaner connected to the outer end of the hollow pipe, particulates which are present in the opening of the drum are sucked into the vacuum cleaner.

BRIEF DESCRIPTION OF THE DRAWING

[0008] FIG. **1** shows a lower perspective view of a particulate collector.

[0009] FIG. **2** shows an upper perspective view of the particulate collector.

[0010] FIG. **3** shows a top down partial cutaway view of the particulate collector.

[0011] FIG. **4** shows a front view of the particulate collector.

[0012] FIG. **5** shows a sectional view of the particulate collector along line **5-5** of FIG. **3**.

[0013] FIG. **6** shows another sectional view of the particulate collector.

[0014] FIG. **7** shows a sectional view of the particulate collector along line **7-7** of FIG. **6**.

[0015] FIG. **8** shows a perspective sectional view of the particulate collector.

[0016] FIG. **9** shows a sectional view of the particulate collector along line **9-9** of FIG. **3**.

[0017] FIG. **10** shows another top down partial cutaway view of the particulate collector.

[0018] FIG. **11** shows a sectional view along line **11-11** of FIG. **10**.

[0019] FIG. **12** shows a back view of the particulate collector.

[0020] FIG. **13** shows another sectional view of the particulate collector.

[0021] FIG. **14** shows a detailed view of detail B of FIG. **13**.

[0022] FIG. **15** shows a sectional view of the particulate collector along line **15-15** of FIG. **10**.

[0023] FIG. **16** shows a top perspective cutaway of the particulate collector.

[0024] FIG. **17** shows a side view of the particulate collector.

[0025] FIG. **18** shows a top view of the particulate collector.

[0026] FIG. **19** shows perspective view of the particulate collector engaged with a drum.

[0027] FIG. **20** shows a side view of the particulate collector in the drum.

[0028] FIG. **21** shows a top down view of the particulate collector engaged with the drum.

[0029] FIG. **22** shows an alternate top down view of the particulate collector engaged with the drum.

[0030] FIG. **23** shows top down perspective view of the particulate collector engaged with the drum.

[0031] FIG. **24** shows a close-up view of the particulate collection with the drum.

[0032] FIG. **25** shows the particulate collection with the drum.

[0033] FIG. **26** shows a bottom top view of a left hand clip for securing the particulate collector to the drum.

[0034] FIG. **27** shows another view of a clip for securing the particulate collector to the drum.

[0035] FIG. **28** shows a side view of a clip for securing the particulate collector to the drum.

[0036] FIG. **29** shows another side view of a clip for securing the particulate collector to the drum.

[0037] FIG. **30** shows a bottom top view of a right hand clip for securing the particulate collector to the drum.

[0038] FIG. **31** shows a schematic of a clip for securing the particulate collector to the drum.

[0039] FIG. **32** shows a top down view of a conventional particulate collector.

[0040] FIG. **33** shows a section of the conventional particulate collector along line D-D of FIG. **32**.

[0041] FIG. **34** shows side view of a conventional particulate collector.

[0042] FIG. **35** shows a schematic of a conventional particulate collector.

[0043] FIG. **36** shows a section of the conventional particulate collector along line E-E of FIG. **32**.

[0044] FIG. **37** shows a detailed view of a conventional particulate collector point B as shown in FIG. **36**.

[0045] FIG. **38** shows a section of a conventional particulate collector along line A-A of FIG. **32**.

DETAILED DESCRIPTION OF THE INVENTION

[0046] FIGS. **1-18** show a particulate collector **100** of an embodiment of the present invention, FIGS. **26-31** show clips used to secure the particulate collector to a drum and FIGS. **19-25** show the particulate collector **100** engaging a drum. The drum **60** preferably has a capacity of 15 gallons or more. The drum **60** has an outer lip **62** along the rim of the drum **60** surrounding an opening **64**.

[0047] The particulate collector **100** has a semielliptical or crescent shaped body **101** with a funneling shield **117**. The semielliptical body **101** has a top portion **103** connected to a bottom portion **102** through C-shaped sides **104**. Between the top portion **103** and the bottom portion **102** is an inner surface wall **107** containing vacuum ports **108**, **109**, **110**. The area A**1**, A**2**, A**3** of the openings of the vacuum ports **108**, **109**, **110** can be the same or can vary in size between the ports. The top portion **103**, bottom portion **102**, inner surface wall **107**, and a C-shaped sides **104** define a first chamber **105**, referred to as a collection chamber. While three vacuum ports **108**, **109**, **110** are shown, the number of ports may be increased or decreased. The collection chamber **105** is also in communication with a first end **106***a* of a hollow pipe **106** through an opening **120** on the C-shaped sides **104** at a back of the semielliptical or crescent shaped body **101**, opposite the inner surface wall **107**. The second end **106***b* of the hollow pipe **106** is attached to a vacuum hose **66** during use of the particulate collector **100**. The hollow pipe **106** may be integrally formed with the semielliptical or crescent shaped body **101** of the particulate collector **100** or secured through other means. The hollow pipe **106** is preferably connected to semielliptical or crescent shaped body **101** of the particulate collector **100** along a centerline C-C. The hollow pipe **106** can be attached to the bottom portion **102** of the particulate collector **100**. The hollow pipe **106** can also be connected at an angle relative to the semielliptical or crescent shaped body **101** of the particulate collector **100**.

[0048] The collection chamber **105** is additionally in communication with a funnel passage **118** through a series of holes **128**. The area of the series of holes **128** is equal to the area A**1**, A**2**, A**3** of at least one of the openings of a vacuum port **108**, or vacuum port **109**, or vacuum port **110**.

[0049] The top and bottom portion **102**, **103** of the semielliptical or crescent shaped body **101** extend laterally outwards beyond the inner surface wall **107** to form a top protruding rim **115** and a bottom protruding rim **116**. The top and bottom protruding rims **115**, **116** are semicircular and preferably correspond to the shape of the outer lip **62** along the rim of the drum **60**, with at least a portion of the bottom portion **102** and the hollow pipe **106** of the particulate collector **100** extending out from the drum **60**. A second chamber **119** is defined between the top protruding rim **115**, a bottom protruding rim **116** and the inner surface wall **107**. The second chamber is in communication with the collection chamber **105** via the vacuum ports **108**, **109**, **110**.

[0050] The top and bottom portions **102**, **103** of the crescent shaped body **101** and the C-shaped sides **104** also form opposed outer curved ends **121** each with outer edges **111**. The curve of the outer curved ends **121** aid in maintaining contact between the drum **60** and the particulate collector **100** through friction. The radius of the curve of the outer curved ends **121** also preferably corresponds to a curvature of the outer lip **62** of the rim of the drum **60**.

[0051] The opposed outer curved ends **121** each contain a slot **112** extending inwards from the outer edge **111**. The slots **112** define an opening **113** that contains a stop **114**. The openings **113** defined between the slots **114** and the stop **114** are greater in thickness than right and left clips **300**, **310** shown in FIGS. **19-24** to allow movement of the clips **300**, **310** within the slot and relative to the lip of the drum. Referring to FIGS. **28-31**, the left clip **300** has a body **304** with a top surface **303**, side surface **301**, a bottom surface **305** and a lip **306** extending out axially outwards from the bottom surface **305**. The lip **306** is angled such that a leading edge **308** is greater in height than the other edge **309** of the lip **306**. The right clip **310** has a body **313** with a top surface **312**, side surface **318**, a bottom surface **314** and a lip **315** extending out axially outwards from the bottom surface **314**. The lip **315** is angled such that a leading edge **317** is greater in height than the other edge **316** of the lip **315**.

[0052] A funnel shield **117** has a C-shaped dome body **123** attached to or formed integrally with the top portion **103** of the semielliptical or crescent shaped body **101** of the particulate collector **100** at an angle. The C-shaped dome body **123** of the funnel shield **117** has a top outer surface **125**, a bottom inner surface **126** and opposed curved outer ends

124. The opposed curved outer ends **124** of the funnel shield **117** extend beyond the top protruding rim **115** and bottom protruding rim **116** to define at least one angled passage **118** which can funnel particulates towards the collection chamber **105** through the holes **128** and to the second chamber **119** with vacuum ports **108**, **109**, **110**. While the funnel shield is shown as extending beyond the top protruding rim **115**, a length, the amount of extension and the length of extension from the top protruding rim **115** can vary.

[0053] The angle of the angled passage **118** formed between the semielliptical or crescent shaped body **101** of the particulate collector **100** relative to the inner surface wall **107** is approximately 15 degrees. A divider wall **127** can be present within the angled passage **118** between the top portion **103** of the semielliptical or crescent shaped body **101** and the bottom inner surface **126** of the funnel shield **117** to create additional passages. It should be noted that all of the angled passages **118** formed by the semielliptical or crescent shaped body **101** and the funnel shield **117** are funnel particulates to the collection chamber **105** in communication with the vacuum ports **108**, **109**, **110** through holes **128**.

[0054] The semielliptical or crescent shaped body **101** of the particulate collector **100** and the funneling shield **117** are preferably symmetric about the centerline C-C.

[0055] Referring to FIGS. **26-31**, to secure the particulate collector **100** to the drum **60**, the particulate collector **100** is placed within the opening **64** of the drum **62** such that the hollow pipe **106** is hanging outside of the drum **60**. The left and right clips **300**, **310** are then aligned with the outer lip **62** of the drum **60** such that the lips **306**, **315** of the clips **300**, **310** can slide under the outer lip **62** of the drum **60**. Once the lips **306**, **315** of the clips **300**, **310** are aligned to engage underneath the outer lip **62** of the drum **60**, the clips **300**, **310** are slid towards the vacuum port **402** within the slots **432**, **434**, pulling the particulate collector within the drum **60** and angling the particulate collector **400** within the drum **60** for particulate collection.

[0056] A vacuum hose **66** has a first end coupled to a vacuum cleaner (not shown) and a second end friction fit onto the second end **106***b* of the hollow pipe **106**. When the vacuum cleaner is turned on, a vacuum is created within the collection chamber **105**, the second chamber **119**, and angled funnel passage **118** defined by the funnel shield **117** and the top portion **103** of the semielliptical or crescent shaped body **101** and as a result, a downward draft is present over the opening **64** of the drum **60**. Any billowing particulates are caught within the downward draft, funneled into the angled funnel passage **118** between the funnel shield **117** and the second chamber **119** directly into the second chamber **119** or into the angled funnel passage **118** and to the collection chamber **105**. Billowing particulates are sucked from the second chamber **119** through vacuum ports **108**, **109**, **110** and into the collection chamber **105**, then into the opening **120** of the hollow pipe **106** and into a vacuum container (not shown) of the vacuum cleaner coupled to the vacuum hose **66**.

[0057] Accordingly, it is to be understood that the embodiments of the invention herein described are merely illustrative of the application of the principles of the invention. Reference herein to details of the illustrated embodiments is not intended to limit the scope of the claims, which themselves recite those features regarded as essential to the invention.

What is claimed is:

1. A particulate collector for attachment to a vacuum cleaner and for preventing particulates from spilling over a top of an opening of a drum during mixing of material in the drum, the opening being defined by a rim with an outer lip, the collector comprising:

a body with opposing curved ends, the body having a top portion extending to an upper rim and a bottom portion extended to a lower rim, and an inner wall surface having at least three ports, the top portion, bottom portion and inner wall surface defining a first chamber and the lower rim, upper rim and inner wall surface defining a second chamber, the first chamber being connected to the second chamber through the at least three ports of the inner wall surface;

a hollow pipe having a tubular body with an outer end for attachment to a vacuum cleaner and an inner end mounted to the body and in communication with the first chamber via a port;

a funnel shield mounted to the top portion of the body extending beyond the upper rim and the lower rim of the body, the funnel shield having a funnel body with a top surface, a bottom surface, and curved outer ends, the bottom surface of the funnel shield body and the top surface of the body defining at least one angled passage; and

wherein when the body of the particulate collector is placed in the opening of the drum, the body rests on the rim of the opening, such that when a vacuum cleaner is connected to the outer end of the hollow pipe, particulates which are present in the opening of the drum are sucked into vacuum cleaner.

2. The collector of claim **1**, wherein the opposing curved ends of the body are curved to correspond to a curvature of the outer lip of the rim of the drum.

3. The collector of claim **1**, wherein an overall shape of the body is semielliptical.

4. The collector of claim **1**, wherein the overall shape of the funnel body is C-shaped.

5. The collector of claim **1**, further comprising at least one slot formed in each of the curved ends of the body.

6. The collector of claim **5**, further comprising at least a first clip and a second clip, each clip being slidably received within a slot formed in a curved end of the body.

7. The collector of claim **6**, wherein each clip comprises: a body with a top surface, a side surface, a bottom surface and a lip defined by a first edge and a second edge, the lip extending axially outwards from the bottom surface and angled relative to the bottom surface such that the first edge is extends further axially outwards than the second edge.

8. The collector of claim **7**, wherein the slots define an opening that is greater in size than a thickness of the first and second clips.

9. The collector of claim **8**, wherein the opening of the slots further comprises a stop that has a thickness equal to the thickness of the first and second clips.

10. The collector of claim **1**, wherein the funnel shield is integrally formed with the top portion of the body.

11. The collector of claim **1**, further comprising a series of holes in communication with the first chamber.

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