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(72) Inventors:
• **MAZZEI, Luca**
51036 Larciano (PT) (IT)
• **OSTUNI, Alessandro**
51036 Larciano (PT) (IT)

(74) Representative: **Mannucci, Michele et al**
Ufficio Tecnico
Ing. A. Mannucci S.r.l.
Via della Scala, 4
50123 Firenze (IT)

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(71) Applicant: **I.M.L. S.r.l.**
51036 Larciano (PT) (IT)

(54) **A MOP WRINGING DEVICE AND KIT COMPRISING SAID DEVICE**

(57) The device comprises an external support destined to be fitted to a bucket and configured to house an internal component. The internal component defines a contraction volume. The external support comprises a plurality of elastically deformable strips and the internal component comprises a plurality of ribs defining a contraction volume and constrained to the external support so as to be able to move with respect thereto. When a mop is inserted into the contraction volume and thrust toward the bottom of the bucket, the internal component and the external support contract accumulating potential elastic deformation energy. When the mop is removed, the external support returns to the condition at rest and thrusts the external component to expand toward the uncontracted condition of the contraction volume.

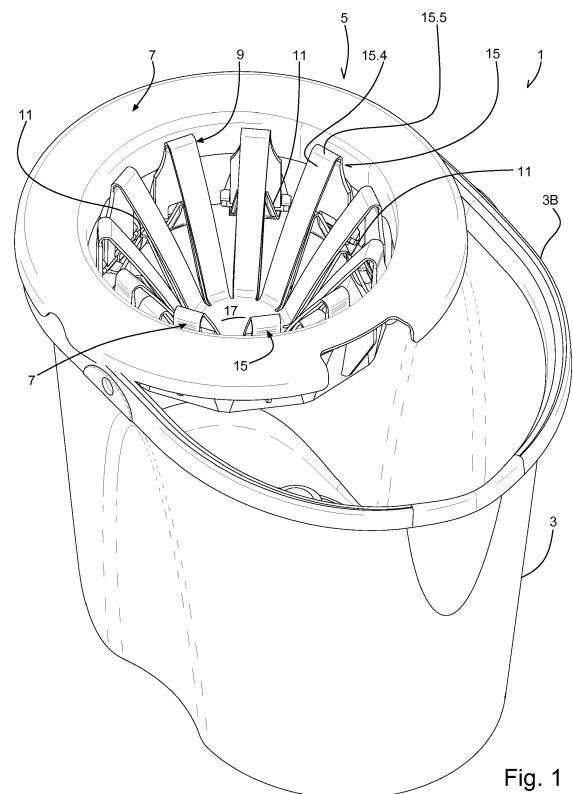


Fig. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to a mop wringing device. The invention also relates to a kit comprising a device of the aforesaid type and a bucket, wherein the device is configured to be fixed to the edge of the bucket.

BACKGROUND ART

[0002] Mops for cleaning floors are known. The mop, in the meaning intended here, is a cleaning tool comprising a core, to which elements made of absorbent material, such as strings or strips of woven fabric, of non-woven fabric or the like, are fixed. The elements of absorbent material are distributed around an axis of the core, which is fixed in a permanent or reversible manner to a maneuvering handle.

[0003] In use, the absorbent material is soaked with water or with an aqueous solution of a detergent. Before passing the mop over the floor to be cleaned, the mop is wrung out in a specific device, usually fixed to the edge of the bucket. In this way the excess water or detergent solution is eliminated before passing the mop over the floor. With the same operations, by repeatedly soaking and wringing out the mop the dirt that has collected on the floor can be eliminated.

[0004] Many different mop wringing devices have been provided. These devices must be inexpensive, efficient and easy to use, as well as reliable and long-lasting.

[0005] WO 2016180561 discloses a mop wringing device comprising an external support adapted to be fixed to the edge of the bucket, and an internal component, housed in the external support. The external support has a conical shape that tapers toward the bottom of the bucket. The internal component comprises a bottom and a top ring spaced from the bottom and of larger diameter than the bottom. Between the ring and the bottom there are arranged laminae elastically deformable by torsion. By rotating the ring with respect to the bottom this causes a deformation of the laminae, which move simultaneously toward the axis of the internal component. A cam profile is arranged between the external support and the internal component. The bottom of the moving component is fixed with respect to the external support, while the ring can rotate with respect to the support. The elastic laminae form a contraction volume, into which the mop is inserted and wrung out. By inserting the mop into this space and imparting a rotation on the mop by means of its handle, a torsion movement of the elastic laminae is caused and a consequent simultaneous movement of the laminae toward the axis of the external support and of the internal component. In this way, the laminae cause wringing out of the mop, which helps to drain the water. This device has some drawbacks, among which a high production cost due to the need to assemble the various device components to one another by interlocking. Moreover, the

maneuvers to wring out the mop are laborious, as they require a strong downward thrust of the mop by means of the respective handle. Moreover, the particular geometry of the rotating part at rest determines a limited useful diameter for insertion of the mop. Therefore, the use of this current art device is not particularly practical.

[0006] ES-2183681 discloses a mop wringing device comprising an external support adapted to be fixed to a bucket, having an approximately conical tapered shape. In the external support there is arranged an internal component of approximately conical tapered shape and movable with respect to the support in a direction parallel to an axis of the external support and of the internal component. The internal component comprises a plurality of ribs or sliding shoes arranged around the axis of the device and forming a contraction volume into which the mop is inserted. The sliding shoes co-act with the external support by means of respective cam profiles formed by inserts made of a material with low friction coefficient, mounted in seats formed in the respective sliding shoes or ribs. The movement of the internal component with respect to the external support causes a radial contraction movement of the ribs. The contraction movement of the ribs or sliding shoes is obtained by pushing the internal component toward the bottom of the external component using the mop. The initial uncontracted position at rest is restored by means of a compression spring, arranged between the bottom of the external support and the single sliding shoes or ribs. The sliding shoes are interlocked with one another.

[0007] This device allows easy operation, but consists of a large number of pieces, which must be mounted with relatively complex operations and the cost of which has a considerable influence on the cost of the finished product. Moreover, a metal coil spring must be provided, which contributes to increasing the cost of the product.

[0008] CN2126791Y discloses a mop wringing device with an external body into which an internal body is guided, which consists of a plurality of converging ribs defining a contraction volume. The converging ribs are guided in grooves of the external body and are constrained thereto by coil springs. The mop to be wrung out is inserted into the contraction volume and pushed toward the bottom thereof, causing a translation of the ribs, which converge toward one another wringing out the mop. When the mop is extracted from the contraction volume, the coil springs draw the ribs upward, returning them to the initial position. The device is not particularly efficient, is complicated and costly to manufacture, and also not very reliable.

[0009] EP1188407 discloses a mop wringing device which comprises an external frame, which engages with the edge of a bucket, from which curvilinear linear components extend to form a contraction volume and which, when a mop is pressed into the contraction volume, expand generating a radial contraction effect on the mop. To prevent the linear components from deforming so as to move away from the mop without exerting the pressure

thereon that is required to expel the water accumulated in the mop, tie rods are provided extending from the external frame to a bottom plate, to which distal ends of the linear components are joined. When the mop is inserted into the contraction volume and wrung out, the tie rods are not deformed and therefore prevent the bottom plate from moving downward. This device generates a modest compression force on the mop and therefore is not particularly efficient.

[0010] ES1041890 discloses a mop wringing device comprising an external support adapted to be fixed to a bucket, comprising an annular body and a plurality of elastically deformable strips, arranged around an axis of the annular body and each having a first end joined to the annular body and a second free end. The elastically deformable strips extend radially from the first ends toward the second ends. The elastic strips have as a whole a truncated cone shape and the second free ends of the elastic strips define a hollow base of the truncated cone. An internal component, arranged coaxially to the external support, is inserted through the hollow base of the truncated cone. The internal component and the external support are movable with respect to each other in a direction parallel to an axis of the external support and of the internal component. The internal component comprises a plurality of ribs arranged around the axis and forming a contraction volume for inserting a mop, with a mouth and a bottom wall, to which the respective ends of the ribs of the internal component are connected. The ribs forming the internal component rest in the lower zone on the free ends, positioned further inward radially, of the elastically deformable strips of the external support. When a mop is forcibly inserted into the contraction volume and is pushed toward the bottom of the internal component, this slides through the cavity surrounded by the elastic strips of the external support, causing a flexural deformation of the elastic strips and causing them to spread apart. Simultaneously, the ribs of the internal component are moved radially toward the axis of the contraction volume, causing wringing out of the mop. These deformations cause the accumulation of elastic energy in the elastic strips of the external support, which is supposed then to generate an upward thrust that should facilitate the upward return movement of the internal component and its spreading apart into the original position, when the thrust exerted by the operator by means of the mop ceases.

[0011] The configuration is such that the elastic thrust generated by the elastic strips of the external support against the ribs of the internal component has a prevalent radial component, i.e. orthogonal to the axis of the external support and of the internal component, and only a weak component parallel to the axis. Only this second component contributes, though inefficiently, to the upward return movement of the internal component, and hence to its radial re-expansion.

[0012] Therefore, there is the need to provide a mop wringing device that entirely or in part overcomes the

drawbacks of prior art devices.

SUMMARY OF THE INVENTION

[0013] To solve or alleviate one or more of the drawbacks of the prior art, a mop wringing device is provided, comprising an external support adapted to be fixed to a bucket and provided with an annular body and a plurality of elastically deformable strips. Each elastically deformable strip comprises a first end joined to the annular body and a second end joined to a bottom element of the external support. The device further comprises an internal component, housed coaxially in the external support and movable with respect to the annular body of the external support in a direction parallel to an axis of the external support and of the internal component. The internal component comprises a plurality of ribs arranged around the axis and forming a contraction volume for insertion of a mop, with a mouth and a bottom wall, to which respective ends of the ribs of the internal component are connected. Each rib of the internal component is connected to the external support and co-acts therewith so that a thrust of a mop inserted into the contraction volume causes a contraction movement of the ribs of the internal component toward the axis of the internal component, and hence a narrowing of the contraction volume defined by said ribs, and a flexural deformation of the elastically deformable strips of the external support. The flexural deformation of the elastically deformable strips of the external support causes an accumulation of elastic energy that generates a thrust of the elastically deformable strips of the external support on the internal component, in opposition to the contraction movement.

[0014] In substance, the elastically deformable strips of the external support form an elastic return member to restore the internal component to the position at rest after sinking into the external support and contracting.

[0015] According to another aspect, the invention relates to a kit comprising a bucket and a device as defined above.

[0016] Further advantageous features and embodiments of the device according to the invention are indicated in the appended claims, which form an integral part of the present description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The invention will be better understood by following the description and the accompanying drawings, which illustrate an exemplifying and non-limiting embodiment of the invention. More particularly, in the drawings:

Fig.1 is an axonometric view of a kit comprising a bucket and a mop wringing device, according to a first embodiment of the invention;

Fig. 2 is an axonometric view of the internal component of the mop wringing device of Fig.1;

Fig.3 is an axonometric view from above of the ex-

ternal support of the mop wringing device of Fig. 1;
 Fig. 4 is an axonometric view from below of the mop wringing device of Fig. 1;
 Fig. 5 is a plan view of the mop wringing device of Fig. 1 in conditions at rest;
 Fig. 6 is a section according to VI-VI of Fig. 5 with the device at rest;
 Fig. 7 a section the same as the section of Fig. 6, with the device in the configuration of maximum contraction;
 Fig. 8 is an axonometric view of a kit comprising a bucket and a mop wringing device, according to a second embodiment of the invention;
 Fig. 9 is an axonometric view of the internal component of the mop wringing device of Fig. 8;
 Fig. 10 is an axonometric view from above of the external support of the mop wringing device of Fig. 8;
 Fig. 11 is an axonometric view from below of the mop wringing device of Fig. 8;
 Fig. 12 is a plan view of the mop wringing device of Fig. 8 in conditions at rest;
 Fig. 13 is a plan view the same as Fig. 12, but in conditions of maximum contraction of the mop wringing device;
 Fig. 14 is a section according to XIV-XIV of Fig. 12, with the device at rest;
 Fig. 15 is a section the same as the section of Fig. 14, with the mop wringing device in the configuration of maximum contraction;
 Fig. 16 is an axonometric view of a kit comprising a bucket and a mop wringing device, according to a third embodiment of the invention;
 Fig. 17 is an axonometric view of the internal component of the mop wringing device of Fig. 16;
 Fig. 18 is an axonometric view from above of the external support of the mop wringing device of Fig. 16;
 Fig. 19 is an axonometric view from below of the external support of the mop wringing device of Fig. 16;
 Fig. 20 is a plan view of the external support of the device of Fig. 16 in conditions at rest; and
 Fig. 21 is a section according to a plane containing the axis of symmetry of the mop wringing device of Fig. 16, in conditions at rest;
 Fig. 22 is an axonometric view from above of an internal component, in a different embodiment;
 Fig. 23 is an axonometric view from below of the internal component of Fig. 22;
 Fig. 24 is an axonometric view from above of an external support adapted to co-act with the internal component of Figs. 22 and 23;
 Fig. 25 is an axonometric view from below of the internal component of Figs. 22, 23 coupled to the external support of Fig. 24;
 Fig. 26 is a plan view of the internal component coupled to the external support;
 Fig. 27 is an axonometric view of the assembly of the internal component and of the external support of Fig. 26; and

Fig. 28 is a section according to XXVIII-XXVIII of Fig. 26.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0018] In the following description the terms of relative position, such as "top", "bottom", "upper", "lower" and the like, refer to the position taken by the respective element when the kit, formed of the device and of the bucket on which it is mounted, are in the normal position of use, resting on a substantially horizontal surface.

[0019] In substance, the device comprises an external support intended to be fitted to a bucket and configured to house an internal component. The internal component defines a contraction volume. The external support comprises a plurality of elastically deformable strips and the internal component comprises a plurality of ribs defining a contraction volume and constrained to the external support so as to be able to move with respect thereto. When a mop is inserted into the contraction volume and pushed toward the bottom of the bucket, the internal component and the external support shrink, accumulating potential elastic deformation energy. When the mop is removed, the external support returns to the condition at rest and pushes the internal component to expand toward the uncontracted condition of the contraction volume.

[0020] The ribs can be constrained to an annular body of the external support, this annular body preferably not being elastically deformable. The constraint can be obtained, for example, with a prismatic pair or with a revolute pair. Prismatic pair is understood as a coupling between two elements (one belonging to the internal component and the other to the external support), which slide with respect to one another. The prismatic pair thus allows a mutual sliding, i.e., translation movement. Revolute pair is understood as a coupling between two elements (one belonging to the internal component and the other belonging to the external support), which can rotate with respect to one another around a rotation axis. The revolute pair, in practice a hinge, thus allows a mutual rotation movement.

[0021] The internal component can be formed by a single body made of an elastically deformable material, for example and in particular a synthetic resin, i.e., a polymer. In the same way, the external support can be formed of a single body made of an elastically deformable material, for example a synthetic resin, i.e., a polymer. The aforesaid two elements can be formed of the same material, or of different materials.

[0022] The elastically deformable strips of the external support can be shaped so as to have an upside-down V-shaped portion, i.e., arranged with the vertex thereof oriented toward the mouth of the contraction volume defined by the internal component.

[0023] In some embodiments, the ribs of the internal component can also have an upside-down V shape.

Embodiment of Figs. 1 to 7

[0024] With initial reference to Fig.1, the numeral 1 indicates as a whole a kit comprising a bucket 3 and a device for wringing out a mop, hereinafter also indicated for brevity as mop wringing device, indicated as a whole with 5. The mop wringing device 5 is fitted along the edge 3B of the bucket 3 and is preferably removable therefrom.

[0025] The mop wringing device 5 comprises an external support 7 and an internal component 9, housed in the external support 7. The internal component 9 is shown in isolation in an axonometric view in Fig.2 and the external support 7 is shown in isolation in an axonometric view in Fig. 3. In the mounted condition the external support 7 and the internal component 9 are substantially coaxial. The common axis of the external support 7 and of the internal component 9 is indicated with X-X. This axis is also indicated hereinafter as axis of the mop wringing device 5.

[0026] As can be seen in particular in Fig.3, the external support 7 comprises an annular body 7.1 with an edge 7.2 for attaching the external support 7 to the bucket 3. A plurality of elastically deformable strips 11 extend from the annular body 7.1. The elastically deformable strips 11 are arranged around the axis X-X and converge toward said axis, defining an approximately truncated cone-shaped tapered volume, in the central zone of the external support 7. In the embodiment of Figs.1 to 7, the elastically deformable strips 11 have a median plane oriented radially, i.e., containing the axis X-X of the mop wringing device 5. In Fig.3 the median plane of one of the elastically deformable strips 11 is represented schematically and indicated with P.

[0027] Each elastically deformable strip 11 has a first end 11.1, at which the elastically deformable strip 11 is joined to the annular body 7.1, and a second end 11.2. The second end 11.2 of each elastically deformable strip 11 is joined to a bottom element 13 of the external support 7. The bottom element 13 can be substantially disc-shaped and forms the bottom of the tapered volume delimited by the elastically deformable strips 11.

[0028] As can be seen in particular in Fig. 3, each elastic strip 11 comprises a first portion 11.3 and a second portion 11.4. The first portion 11.3 extends from the first end 11.1 to an intermediate curve or bend 11.5. The first portions 11.3 converge upward, and toward the axis X-X. The second portion 11.4 extends from the intermediate curve or bend 11.5 to the second end 11.2. The second portions 11.4 of the elastically deformable strips 11 converge downward, i.e. toward the bottom element 13, and toward the axis X-X. The first portion 11.3 of each elastically deformable strip 11 defines, with the curved ends thereof, an S shape.

[0029] As can be understood from Figs.6 and 7, when an axial thrust F is exerted toward the bottom element 13, the elastically deformable strips 11 deform from the position of Fig.6, where the second portions 11.4 delimit the truncated cone-shaped tapered volume, to the posi-

tion of Fig. 7, where the second portions 11.4 of the elastically deformable strips 11 are arranged approximately parallel to the axis X-X changing the truncated cone-shaped volume into a substantially cylindrical volume, whose diameter is approximately the same as the diameter of the bottom element 13. In this movement the first portions 11.3 of the elastically deformable strips 11 pass from a position in which they are more inclined upward to a position in which they are less inclined.

[0030] The external support 7 can advantageously be made in one piece of molded plastic material, for example a polymer with suitable mechanical strength and elasticity. The elastically deformable strips 11 are joined to the top annular body 7.1 and to the bottom element 13 by means of flaps made of synthetic material with suitable thickness to allow the elastically deformable strips 11 to flex, as can be seen in Figs.6 and 7.

[0031] As shown in particular in Fig.2, the internal component 9 comprises a plurality of ribs 15 joined centrally to a bottom wall 17. In practical embodiments, the internal component 9 can comprise a rib 15 for each elastically deformable strip 11 of the external support 7. In the mounted condition each rib 15 is positioned above the respective elastically deformable strip 11.

[0032] The ribs 15 are deformable, and preferably elastically deformable, so as to be able to contract and expand cyclically.

[0033] Each rib 15 comprises a first end 15.1 and a second end 15.2. As described below, the first end 15.1 is connected to the external support 7 and more precisely to the annular body 7.1 thereof. The second end 15.2 is joined to the bottom wall 17. Each rib 15 has an upside-down V shape, similar to that of the elastically deformable strips 11 of the external support 7. More in particular, each rib 15 comprises a first segment 15.3 and a second segment 15.4, joined to each other by an intermediate curve or bend 15.5. More in particular, the first segment 15.3 extends from the first end 15.1 to the intermediate curve 15.5 and the second segment 15.4 extends from the intermediate curve 15.5 to the second end. The first segments 15.3 converge upward, and toward the axis X-X of the mop wringing device 5, while the second segments 15.4 converge downward and toward the axis X-X, forming a truncated cone-shaped contraction volume VC. The contraction volume VC extends from a mouth, defined by the plane on which the intermediate curves 15.5 lie, to the bottom wall 17. The intermediate curve 15.5 of each elastically deformable strip has a convexity facing the opposite side with respect to the contraction volume VC, i.e., facing the outside of the contraction volume VC.

[0034] As can be seen in particular in Figs. 6 and 7, the ribs 15, which as a whole have an upside-down V shape, are stacked on the elastically deformable strips 11, which are also characterized by an upside-down V shape. When the mop wringing device 5 is in the mounted condition and at rest, the bottom wall 17 of the internal component 9 rests on the bottom element 13 of the ex-

ternal support 7 and the second segments 15.4 of the ribs 15 are each adjacent to a corresponding second portion 11.4 of the respective elastically deformable strip 11 below.

[0035] The ribs 15 of the internal component 9 and the bottom wall 17 thereof can advantageously be formed by a single molded piece, for example made of plastic or polymer, material. The joining zone, at the second end 15.2 of each rib 15, between the ribs 15 and the bottom wall 17, can be formed by a flap made of polymer material with suitable thickness to form a sort of hinge.

[0036] The first end 15.1 of each rib 15 is constrained to the external support 7 by means of a hinge, which allows the rib 15 to rotate with respect to a respective axis A-A. One of said axes A-A is shown in Figs. 4 and 5. See also Fig. 2.

[0037] In some embodiments, the connection hinge between rib 15 and external support 7 comprises a cylindrical pin 15.6 formed in one piece with the rib 15, which interlocks with the external support 7 at the first end 11.1 of the respective elastically deformable strip 11. Interlocking of each rib 15 is obtained, for example, with three appendages formed in one piece with the external support 7, and more precisely a pair of lateral appendages 19 and a central appendage 21, shown in particular in Fig. 3. The pin 15.6 is inserted between the lateral appendages 19 and the central appendage 21 and forms therewith the connection hinge between rib 15 and external support 7.

[0038] Operation of the mop wringing device 5 described above is as follows. The mop wringing device 5 is fitted, as shown in Fig. 1, to the edge 3B of the bucket 3 so that the contraction volume VC defined between the ribs 15 of the internal component 9 is facing with its mouth upward. At rest the mop wringing device 5 takes the form shown in Figs. 1 to 5 and in greater detail in the section of Fig. 6. The contraction volume VC is relaxed and the ribs 15 are arranged according to a conical surface with a wide aperture. The elastically deformable strips 11 are in the condition at rest, i.e., of minimum energy, in which the tensions inside the material of which they are composed are minimum.

[0039] To wring out a mop (not shown) and in this way allow removal of the water retained by the absorbent elements of the mop by wringing, the mop (or more precisely the part thereof formed by the absorbent material) is inserted into the contraction volume VC and pressed by the user against the bottom wall 17 of the internal component 9. In Figs. 6 and 7, F indicates the force that the user exerts on the internal component 9 of the mop wringing device 5 by means of the handle of the cleaning tool to which the mop is fitted...

[0040] The thrust causes a lowering according to the arrow F of the bottom wall 17 of the internal component 9, toward the bottom of the bucket 3. The ribs 15 follow this lowering movement, causing a rotation of each rib 15 around the respective axis A-A and a widening of the angle formed between the segments 15.3 and 15.4, with

consequent opening of the intermediate curve or bend 15.5. The movement described takes the mop wringing device 5 from the condition of Fig. 6 to the condition of Fig. 7.

[0041] As a result of the thrust F and of the above described movement of the ribs 15, the elastically deformable strips 11 are deformed from the low-energy relaxed configuration, shown in Fig. 6, to the deformed configuration of Fig. 7, with a rotation of the portions 11.3 around a rotation axis, substantially parallel to the axis A-A. This movement is allowed by the polymer material that forms the connection flaps between the annular body 7.1 and the elastically deformable strips 11, flaps which in substance define the first ends 11.1 of the elastically deformable strips 11.

[0042] Due to the above described movements, the contraction volume VC passes from the form and dimension of Fig. 6 (widened conical, tapered downward), to the form and dimension of Fig. 7 (contracted cylindrical). As a result of the reduction in diameter of the contraction volume VC, a substantially radial compression force, i.e., oriented toward the axis X-X of the mop wringing device 5, is exerted on the mop. The reduction in the diameter of the contraction volume VC causes wringing out of the mop and hence the release of water therefrom, which is drained into the bucket 3 through the spaces left free between the ribs 15 and between the elastically deformable strips 11.

[0043] When the user stops pressing the mop against the bottom wall 17 of the internal component 9 and removes the mop therefrom, the thrust F ceases. Consequently, the elastic energy (potential energy), accumulated in the elastically deformable strips 11 and in the ribs 15 as a result of the deformation from the condition of Fig. 6 to the condition of Fig. 7, is released. The device returns to the configuration of Fig. 6. In other words, as a result of the elastic return of the elastically deformable strips 11 and of the ribs 15 the mop wringing device 5 re-expands: the elastically deformable strips 11 tend to return to the relaxed, lower energy position of Fig. 6 and in doing so they push the ribs 15 upward, facilitating the elastic return of the ribs 15.

[0044] In practice, the elastically deformable strips 11 of the external support 7 form elastic return elements that restore the contraction volume VC to its original shape (Fig. 6) ready to receive the mop again and perform a new contraction operation.

[0045] In the exemplary embodiment of Figs. 1 to 7, the ribs 15 rotate around axes A-A that are oriented so that the rotation of the rib 15 around the respective axis A-A causes a movement of the rib 15 in a radial direction, i.e., according to a direction oriented toward the axis X-X of the mop wringing device 5. The direction of movement of the rib 15 is represented by arrow f15 in Fig. 5. Therefore, also the force exerted by the ribs 15 on the mop inserted into the contraction volume VC is substantially radial, with the exception of a component oriented in axial direction, i.e., parallel to the axis X-X.

Embodiment of Figs. 8 to 15

[0046] Figs. 8 to 15 show a second embodiment of a mop wringing device according to the invention. Identical or equivalent parts are labeled with the same reference numbers increased by "100".

[0047] In Fig.8, the number 101 indicates as a whole a kit comprising a bucket 103 and a mop wringing device 105. The mop wringing device 105 is fitted along the edge 103B of the bucket 3 and is preferably removable therefrom.

[0048] The mop wringing device 105 comprises an external support 107 and an internal component 109, housed in the external support 107. The internal component 109 is shown in isolation in an axonometric view in Fig.9 and the external support 107 is shown in isolation in an axonometric view in Fig. 10. In the mounted condition the external support 107 and the internal component 109 are substantially coaxial. The common axis of the external support 107 and of the internal component 109 (axis of the mop wringing device 5) is indicated with X-X.

[0049] As can be seen in particular in Fig.10, the external support 107 comprises an annular body 107.1 with an edge 107.2 (see also Fig. 11) for attaching the external support 107 to the bucket 103. A plurality of elastically deformable strips 111 extend from the annular body 107.1. The elastically deformable strips 111 are arranged around the axis X-X and converge toward it, defining an approximately truncated cone-shaped tapered volume in the central zone of the external support 107. Each elastically deformable strip 111 comprises a first end 111.1, at which the elastically deformable strip 111 is joined to the annular body 107.1, and a second end 111.2. The second end 111.2 of each elastically deformable strip 111 is joined to a bottom element 113 of the external support 107. The bottom element 113 can be substantially disc-shaped and forms the bottom of the tapered volume delimited by the elastically deformable strips 111.

[0050] As can be seen in particular in Fig. 3, each elastic strip 111 comprises a first portion 111.3 and a second portion 111.4. The first portion 111.3 extends from the first end 111.1 to an intermediate curve or bend 111.5. The first portions 111.3 converge upward, and toward the axis X-X of the external support 7. The second portion 111.4 of each elastically deformable strip 111 extends from the intermediate curve or bend 111.5 to the second end 111.2. The second portions 111.4 of the elastically deformable strips 111 converge downward, i.e., toward the bottom element 113 and toward the axis X-X.

[0051] Unlike Figs. 1 to 7, in the embodiment of Figs.8 to 15 the median plane of the elastically deformable strips 111 may not be radial, i.e., may not contain the axis X-X of the mop wringing device 105. This orientation of the median plane of the elastically deformable strips 111 can be seen in particular in Fig.10 where the median plane of one of the elastically deformable strips 111 is schematically indicated with P.

[0052] As can be understood from Figs.14 and 15,

when an axial thrust F is exerted toward the bottom element 113, the elastically deformable strips 111 are deformed from the position of Fig.14, where the second portions 111.4 delimit the truncated cone-shaped tapered volume, to the position of Fig. 15, where the second portions 111.4 are arranged approximately parallel to the axis X-X changing the truncated cone-shaped tapered volume into a substantially cylindrical volume, whose diameter is approximately the same as the diameter of the bottom element 113. The deformation causes a widening of the curved ends of the first portion 111.3 of each elastically deformable strip 111.

[0053] The external support 107 can advantageously be made in one piece of molded plastic material, for example a polymer with suitable mechanical strength and elasticity. The elastically deformable strips 111 are joined to the top annular body 107.1 and to the bottom element 113 by means of flaps made of synthetic material with suitable thickness, to allow the elastically deformable strips 111 to flex, as can be seen in Figs. 14 and 15.

[0054] As shown in particular in Fig.9, the internal component 109 comprises a plurality of ribs 115 joined centrally to a bottom wall 117.

[0055] In practical embodiments, the internal component 109 has a rib 115 for each elastically deformable strip 111 of the external support 107. In the mounted condition each rib 115 is placed approximately above the respective elastically deformable strip 111.

[0056] Each rib 115 comprises a first end 115.1 and a second end 115.2. The first end 115.1 is connected, in the manner described below, to the external support 107 and more precisely to the annular body 107.1 thereof. The second end 115.2 is joined to the bottom wall 117. Each rib 115 has an upside-down V shape, similar to that of the elastically deformable strips 111 of the external support 107. More in particular, each rib 115 comprises a first segment 115.3 and a second segment 115.4, joined to each other by an intermediate curve or bend 115.5. More in particular, the first segment 115.3 extends from the first end 115.1 to the intermediate curve 115.5 and the second segment 115.4 extends from the intermediate curve 115.5 to the second end 115.2 of the rib 115. The first segments 115.3 converge upward, and toward the axis X-X of the mop wringing device 105, while the second segments 115.4 converge downward and toward the axis X-X, forming a truncated cone-shaped contraction volume VC. The contraction volume VC extends from a mouth, defined by the plane on which the intermediate curves 115.5 lie, to the bottom wall 117.

[0057] As can be seen in particular in the Figs. 14 and 15, the ribs 115, which as a whole have an upside-down V shape, are stacked on the elastically deformable strips 111, also characterized by an upside-down V shape. When the mop wringing device 105 is in the mounted condition and at rest, the bottom wall 117 of the internal component 109 rests on the bottom element 113 of the external support 109 and the second segments 115.4 of the ribs 115 are each adjacent to a corresponding second

portion 111.4 of the respective elastically deformable strip 111 below.

[0058] The ribs 115 of the internal component 109 and the bottom wall 117 thereof can be advantageously formed of a single molded piece, for example made of plastic or polymer material. The joining zone, at the second end 115.2 of each rib 115, between the ribs 115 and the bottom wall 117 can be formed by a flap made of polymer material with suitable thickness to form a sort of hinge.

[0059] The first end 115.1 of each rib 115 is constrained to the external support 107 by means of a hinge, which allows the rib 115 to rotate with respect to a respective axis A-A. The axes A-A are indicated in particular in Figs. 12 and 13.

[0060] In some embodiments, the connection hinge between rib 115 and external support 107 comprises a cylindrical pin 115.6 formed in one piece with the rib 115, which interlocks with the external support 107 at the first end 111.1 of the respective elastically deformable strip 111. Interlocking is obtained by means of a respective seat 119 (Fig.10) formed on the annular body 107.1 of the external support 107, close to the first end 111.1 of the corresponding elastically deformable strip 111.

[0061] Operation of the mop wringing device 105 described above is as follows. The mop wringing device 105 is fitted, as shown in Fig.8, to the edge 103B of the bucket 103 so that the contraction volume VC defined between the ribs 115 of the internal component 109 is facing with its mouth upward. At rest, the mop wringing device 105 takes the form shown in Figs. 8 to 12 and 14 (condition of minimum energy, i.e., of minimum internal stresses in the plastic material, of which the mop wringing device 5 is formed). The contraction volume VC is spread apart and the ribs 115 are arranged according to a conical surface with a wide aperture.

[0062] To wring out a mop (not shown) and in this way allow removal of the water retained by the absorbent elements of the mop by means of wringing, the mop is inserted into the contraction volume VC and pressed by the user against the bottom wall 117 of the internal component 109. In Figs. 14 and 15, F indicates the force that the user exerts on the internal component 109 of the mop wringing device 5 by means of the handle of the cleaning tool to which the mop is fitted..

[0063] The thrust F causes a lowering according to the arrow F of the bottom wall 117 of the internal component 109 toward the bottom of the bucket 103. The ribs 115 follow this lowering movement, causing a rotation of each rib 115 around the respective axis A-A and a widening of the angle formed between the segments 115.3 and 115.4, with consequent opening of the intermediate curve or bend 115.5. The movement described takes the mop wringing device 105 from the condition of Figs. 12 and 14 to the condition of Figs. 13 and 15.

[0064] As a result of the thrust F and of the movement described above of the ribs 115, the elastically deformable strips 111 deform from the relaxed configuration of

Figs. 12 and 14 to the deformed configuration of Figs. 13 and 15, with a rotation of the portions 11.3 around a rotation axis, orthogonal to the centerline P (Fig.10) of the respective elastically deformable strip 111. This movement is allowed by the polymer material that forms the connection flaps between the annular body 107.1 and the elastically deformable strips 111, flaps that in substance define the first ends 111.1 of the elastically deformable strips 111.

[0065] Due to the above described movements, the contraction volume VC passes from the shape and dimension of Figs. 12 and 14 (widened conical, tapered downward), to the contracted form and dimension of Figs. 13 and 15. The deformation generates internal stresses in the polymer material of the ribs 115 and of the elastically deformable strips 111. In the same way as described with reference to Figs. 1 to 7, an accumulation of elastic energy (potential energy) is obtained in the material and in particular in the elastically deformable strips 111.

[0066] As a result of the reduction in the diameter of the contraction volume VC, a compression force is exerted on the mop. The reduction in the diameter of the contraction volume VC causes wringing out of the mop and hence the release of water therefrom, which is drained into the bucket 103 through the spaces left free between the ribs 115 and between the elastically deformable strips 111.

[0067] When the user stops pressing the mop against the bottom wall 117 of the internal component 109 of the mop wringing device 105 and removes the mop therefrom, the thrust F ceases. Consequently, the elastic energy (potential energy) accumulated in the elastically deformable strips 111 and in the ribs 115 as a result of the deformation from the condition of Figs.12 and 14 to the condition of Figs.13 and 15 is released, and the device returns to the configuration of Figs. 12 and 14. In other words, as a result of the elastic return of the elastically deformable strips 111 and of the ribs 115 the mop wringing device 105 re-expands: the elastically deformable strips 111 tend to return to the relaxed lower energy position of Figs. 12 and 14 and in doing so they push the ribs 115 upward, facilitating the elastic return of the ribs 115.

[0068] In practice, the elastically deformable strips 111 of the external support 107 form elastic return elements that restore the contraction volume VC to its original shape (Figs. 12 and 14) ready to receive the mop again and perform a new contraction operation.

[0069] In the exemplary embodiment of Figs. 8 to 15, the ribs 115 rotate around axes A-A that are oriented so that the rotation of the rib 115 around the respective axis A-A causes a movement of the rib 115 in non-radial direction (as described with reference to Figs.1 to 7), but inclined as represented by the arrows f115 in Figs. 12 and 13, i.e., according to a direction oriented tangentially with respect to the contraction volume VC. In this way a force is exerted on the mop contained in the contraction volume VC that has a tangential component tending to

rotate the mop around the axis X-X, increasing the efficiency of the device.

[0070] In practice, with the inclined arrangement of the axes A-A as shown in Figs.12 and 13, a rotation movement of the ribs 115 around the axis X-X of the mop wringing device 5 is obtained, as well as the movement toward said axis. This makes it possible to obtain greater efficiency of the device than in the embodiment of Figs.1 to 7, in that the mop is subjected not only to a radial compression but also to a torsional force, with more efficient removal of water from the fibers that form the absorbent part of the mop.

Embodiment of Figs. 16 to 21

[0071] Figs.. 16 to 21 show a third embodiment of a mop wringing device according to the invention. The same or equivalent parts are labeled with the same reference numbers used in the embodiment of Figs. 1 to 7, increased by "200".

[0072] With initial reference to Fig.16, the reference number 201 indicates as a whole a kit comprising a bucket 203 and a mop wringing device 205. The mop wringing device 205 is fitted along the edge 203B of the bucket 3 and is preferably removable therefrom.

[0073] The mop wringing device 205 comprises an external support 207 and an internal component 209, housed in the external support 207. The internal component 209 is shown in isolation in an axonometric view in Fig.17 and the external support 207 is shown in isolation in an axonometric view from above in Fig. 18 and from below in Fig.19. Fig.20 shows the external support 207 from above in a plan view. In the mounted condition the external support 207 and the internal component 209 are substantially coaxial. The common axis of the external support 207 and of the internal component 209 is indicated with X-X, see in particular the section of Fig.21.

[0074] As can be seen in particular in Fig.18, the external support 207 comprises an annular body 207.1 with an edge 207.2 for attaching the external support 207 to the bucket 203. A plurality of elastically deformable strips 211 extend from the annular body 207.1. The elastically deformable strips 211 are arranged around the axis X-X and converge toward it, thus defining an approximately truncated cone-shaped tapered volume in the central zone of the external support 207. In the embodiment of Figs.16 to 21, the elastically deformable strips 211 have a radial median plane, i.e., containing the axis X-X. In Fig.18, the median plane of one of the elastically deformable strips 11 is represented schematically and indicated with P.

[0075] Each elastically deformable strip 211 comprises a first end 211.1, at which the elastically deformable strip 211 is joined to the annular body 207.1, and a second end 211.2. The second end 211.2 of each elastically deformable strip 211 is joined to a bottom element 213 of the external support 207. The bottom element 213 can be substantially disc shaped and form the bottom of the

tapered volume delimited by the elastically deformable strips 211.

[0076] As can be seen in particular in Figs. 18, 20 and 21, each elastic strip 211 comprises a first portion 211.3 and a second portion 211.4. The first portion 211.3 extends from the first end 211.1 to an intermediate curve or bend 211.5. In some embodiments, the first portion 211.3 forms, together with the intermediate curve or bend 211.5, an S-shaped element. The first portions 211.3 converge upward, and toward the axis X-X of the mop wringing device 205. The second portion 211.4 extends from the intermediate curve or bend 211.5 to the second end 211 of the respective elastically deformable strip 211. The second portions 211.4 of the elastically deformable strips 211 converge downward, i.e., toward the bottom element 213, and toward the axis X-X.

[0077] As can be understood from Fig.21, when an axial thrust F is exerted toward the bottom element 213, the elastically deformable strips 211 deform from the position of Fig.21, where the second portions 211.4 delimit the truncated cone-shaped tapered volume, to a position (not shown) where the second portions 211.4 are arranged approximately parallel to the axis X-X changing the truncated cone-shaped tapered volume into a substantially cylindrical volume, whose diameter is approximately the same as the diameter of the bottom element 213. In this lowering movement the curved zones of connection to the ends of the first portion 211.3 of each elastically deformable strip 211 tend to open.

[0078] The external support 207 can advantageously be made in one piece of molded plastic material, for example a polymer with suitable mechanical strength and elasticity. The elastically deformable strips 211 are joined to the top annular body 207.1 and to the bottom element 213 by means of flaps made of synthetic material with a suitable thickness to allow the elastically deformable strips 211 to flex.

[0079] As shown in particular in Fig.17, the internal component 209 comprises a plurality of ribs 215 joined at respective lower ends to a bottom wall 217. In practical embodiments, the internal component 209 has a rib 215 for each elastically deformable strip 211 of the external support 207. In the mounted condition, each rib 215 is placed in an intermediate position between two elastically deformable strips 211, for reasons that will be apparent below.

[0080] Each rib 215 comprises a first end 215.1 and a second end 215.2. The second end 215.2 is joined to the bottom wall 217. Between the ends 215.1 and 215.2 the ribs 215 extend substantially rectilinearly.

[0081] In the configuration at rest, the ribs 215 of the internal component 209 are arranged according to a conical configuration and converge downward and toward the axis X-X of the mop wringing device 5, forming a truncated cone-shaped contraction volume VC. The contraction volume VC extends from a mouth, defined by the plane on which the first ends 215.1 of the ribs 215 lie, to the bottom wall 217.

[0082] When the mop wringing device 5 is in the mounted condition and at rest (Fig.21), the bottom wall 217 of the internal component 209 rests on the bottom element 213 of the external support 209 and each rib 215 is interposed between two elastically deformable strips 211 of the external support 207. In the illustrated embodiment the bottom wall 217 and the bottom element 213 have mutual coupling members, in the example formed by protrusions formed on the lower surface of the bottom wall 217, which are inserted into holes formed in the bottom element 213. A reversed arrangement, or coupling members of different shape, can also be provided. In other embodiments the coupling members can be omitted. Coupling members can also be provided in the embodiments described above.

[0083] The ribs 215 of the internal component 209 and the bottom wall 217 thereof can advantageously be formed of a single molded piece, for example made of plastic or polymer material. The joining zone, at the second end 215.2 of each rib 215, between the ribs 215 and the bottom wall 217, can be formed by a flap made of polymer material with suitable thickness to form a sort of hinge.

[0084] In the illustrated embodiment, each rib 215 is constrained to the external support 207 by means of a sliding guide that allows the ribs 215 to slide downward and move toward the axis X-X of the mop wringing device 205 with a contraction movement, which reduces the truncated cone-shaped contraction volume VC defined by the ribs 215.

[0085] More in particular, in the embodiment illustrated in Figs. 16 to 21 each rib 215 has, on its face that faces downward, i.e. on the opposite side with respect to the contraction volume VC, an appendage 220 with a slot or a notch 221. When the internal component 209 is mounted in the external support 207, each appendage 220 engages, with the notch 221 thereof, with a guide 223 formed in one piece with the external support 207. More in particular, the annular body 207.1 of the external support 207 is provided with a guide 223 interposed between each consecutive, i.e., adjacent, pair of elastically deformable strips 211, see in particular Figs. 20 and 21. The appendage 220 of each rib 215 can slide along the respective rectilinear guide 223 under the thrust of a force F (Fig.21), so that the assembly of ribs 215 is lowered toward the bottom of the bucket 203 and at the same time narrows, i.e., contracts, as a result of the rotation of each rib 215 around a rotation axis defined by the join between rib 215 and bottom wall 217. The guides 223 are inclined and converging downward and toward the axis X-X, so as to force the ribs 215 to converge toward the axis X-X as a result of a vertical thrust.

[0086] To engage the internal component 209 with the external support 207, each rib 215 can have a stem 215.8 (see in particular Figs. 17 and 21). The stem 215.8, which can be made in one piece with the remaining parts of the internal component 209, engages slidingly under two adjacent elastically deformable strips 211.

[0087] Operation of the mop wringing device 205 is as follows. The mop wringing device 5 is fitted, as shown in Fig. 16, to the edge 203B of the bucket 203 so that the contraction volume VC defined between the ribs 215 of the internal component 209 is facing with its mouth upward. At rest the mop wringing device 205 takes the form shown in Fig.21. The contraction volume VC is relaxed and the ribs 215 are arranged according to a conical surface with a wide aperture.

[0088] To wring out a mop (not shown) and in this way allow removal of the water retained by the absorbent elements of the mop by means of compression, the mop is inserted into the contraction volume VC and pressed by the user against the bottom wall 217 of the internal component 209. In Fig. 21 F indicates the force that the user exerts on the internal component 209 of the mop wringing device 205 by means of the handle of the cleaning tool to which the mop is fitted.

[0089] The thrust F causes a lowering according to the arrow F of the bottom wall 17 of the internal component 209, toward the bottom of the bucket 3. The ribs 215 follow this lowering movement sliding along the guides 223, causing a rotation of each rib 215 around the respective axis defined by the join between end 211.2 and bottom wall 217. As a result of the sliding of the ribs 215 along the guides 223 and of the inclination thereof, the ribs 215 contract, i.e. move toward the axis X-X reducing the diameter of the contraction volume VC. The guide 223 can have an end of travel stop 223.1 to stop the downward movement of the ribs 215.

[0090] As a result of the thrust F and of the movement of the ribs 215 described above, the elastically deformable strips 211 deform from the relaxed configuration of Fig.21 to a deformed configuration, not shown. The movement of the elastically deformable strips 211 brings the portions 211.4 thereof to a position approximately parallel to the axis X-X and causes a deformation (widening) of the curvilinear zones of the elastically deformable strips, which are located at the ends of the first portion 211.3. This deformation causes an accumulation of potential energy (elastic energy) in the elastically deformable strips 211.

[0091] As a result of the reduction in diameter of the contraction volume VC, a substantially radial compression force, i.e. oriented toward the axis X-X of the mop wringing device 205, is exerted on the mop. The reduction in the diameter of the contraction volume VC causes wringing out of the mop and hence the release of water therefrom, which is drained into the bucket 3 through the spaces left free between the ribs 215 and between the elastically deformable strips 211.

[0092] When the user stops pressing the mop against the bottom wall 217 of the internal component 209 of the mop wringing device 205 and removes the mop therefrom, the thrust F ceases. Consequently, the elastic energy (potential energy) accumulated in the elastically deformable strips 211, as a result of the deformation described above, is released and the mop wringing device

205 returns to the configuration of Fig.21. The strips 211 thrust the ribs 215 elastically upward. In other words, as a result of the elastic return of the elastically deformable strips 211 the mop wringing device 205 re-expands: the elastically deformable strips 211 tend to return to the relaxed lower energy position of Fig.21 and in doing so they thrust the ribs 215 upward.

[0093] In practice, the elastically deformable strips 211 of the external support 207 form elastic return elements that restore the contraction volume VC to its original shape (Fig.21) ready to receive the mop again and perform a new contraction operation.

Embodiment of Figs. 22 to 28

[0094] Figs. 22 to 28 show an embodiment improved compared to the embodiment of Figs. 1 to 7. Similar or corresponding parts are labeled with the same reference numbers as in Figs. 1 to 7, increased by "300".

[0095] The mop wringing device of Figs. 22 to 28 is illustrated in its assembled condition in Figs. 26 to 28 and is indicated therein as a whole with 305. The mop wringing device 305 can be fitted along the edge 3B of the bucket 3, as shown for the mop wringing device 5 in Fig.1. The mop wringing device 305 comprises an external support 307 shown isolated in Fig. 24, and an internal component 309, housed in the external support 307 and shown isolated in Figs. 22 and 23. In the mounted condition the external support 307 and the internal component 309 are substantially coaxial. The common axis of the external support 307 and of the internal component 309 is indicated with X-X. This axis is also indicated below as axis of the mop wringing device 305.

[0096] As can be seen in particular in Figs. 24 to 28, the external support 307 comprises an annular body 307.1 with an edge 7.2 for fastening the external support 307 to the bucket 3. A plurality of elastically deformable strips 311 extend from the annular body 307.1. The elastically deformable strips 311 are arranged around the axis X-X and converge toward said axis, defining an approximately truncated cone-shaped tapered volume in the central zone of the external support 307. The elastically deformable strips 311 have a radially oriented median plane, i.e., containing the axis X-X of the mop wringing device 305.

[0097] Each elastically deformable strip 311 has a first end 311.1, at which the elastically deformable strip 311 joins to the annular body 307.1, and a second end 311.2. The second end 311.2 of each elastically deformable strip 311 is joined to a bottom element 313 of the external support 307. The bottom element 313 can be substantially disc-shaped and forms the bottom of the tapered volume delimited by the elastically deformable strips 311.

[0098] Each elastic strip 311 comprises a first portion 311.3 and a second portion 311.4. The first portion 311.3 extends from the first end 311.1 to an intermediate curve or bend 311.5. The first portions 311.3 converge upward, and toward the axis X-X. The second portion 311.4 of

each elastically deformable strip 311 extends from the intermediate curve or bend 311.5 to the second end 311.2. The second portions 311.4 of the elastically deformable strips 311 converge downward, i.e. toward the bottom element 313, and toward the axis X-X. The first portion 311.3 of each elastically deformable strip 311 defines, with the curved ends thereof, an S shape.

[0099] In the same way as described, for example, with reference to the embodiment of Figs. 1 to 6, when an axial thrust F (Fig.28) is exerted toward the bottom element 313, the elastically deformable strips 311 deform in the same way as described for the embodiments illustrated above, changing the truncated cone-shaped tapered volume into a substantially cylindrical volume, whose diameter is approximately the same as the diameter of the bottom element 313. In this movement the first portions 311.3 of the elastically deformable strips 311 move from a position in which they are more inclined upward, to a position in which they are less inclined. Elastic energy accumulates inside them.

[0100] The external support 307 can advantageously be made in one piece of molded plastic material, for example a polymer with suitable mechanical resistance and elasticity. The elastically deformable strips 311 are joined to the top annular body 307.1 and to the bottom element 313 by means of flaps made of polymer material with suitable thickness to allow the elastically deformable strips 311 to flex, as described.

[0101] As shown in particular in Figs. 22, 23, 27 and 28, the internal component 309 comprises a plurality of ribs 315 joined centrally to a bottom wall 317. In practical embodiments, the internal component 309 can comprise a rib 315 for each elastically deformable strip 311 of the external support 307. In the mounted condition each rib 315 is placed above the respective elastically deformable strip 311. The ribs 315 are deformable, and preferably elastically deformable, so as to be able to contract and expand cyclically, in the same way as the elastically deformable strips 311.

[0102] Each rib 315 comprises a first end 315.1 and a second end 315.2. The first ends 315.1 are connected to an annular element 315.7, by means of which the internal component 309 is connected to the external support 307 and more precisely to the annular body 307.1 thereof, in the manner described below. The second end 315.2 is joined to the bottom wall 317. Each rib 315 has an upside-down V shape, similar to that of the elastically deformable strips 311 of the external support 307. More in particular, each rib 315 comprises a first segment 315.3 and a second segment 315.4, joined to each other by an intermediate curve or bend 315.5. More in particular, the first segment 315.3 extends from the first end 315.1 to the intermediate curve 315.5 and the second segment 315.4 extends from the intermediate curve 315.5 to the second end 315.2. The first segments 315.3 converge upward, and toward the axis X-X of the mop wringing device 305, while the second segments 315.4 converge downward and toward the axis X-X, forming a truncated

cone-shaped contraction volume VC. The contraction volume VC extends from a mouth, defined by the plane on which the intermediate curves 315.5 lie, to the bottom wall 317. The ribs 315, which have as a whole an upside-down V shape, are stacked on the elastically deformable strips 311, also characterized by an upside-down V shape. When the mop wringing device 305 is in the mounted condition and at rest, the bottom wall 317 of the internal component 309 rests on the bottom element 313 of the external support 309 and the second segments 315.4 of the ribs 315 are each adjacent to a corresponding second portion 311.4 of the respective elastically deformable strip 311 below (Fig.28).

[0103] The ribs 315 of the internal component 309 and the bottom wall 317 thereof can advantageously be formed of a single molded piece, for example made of plastic or polymer material. The joining zone, at the second end 315.2 of each rib 315, between the ribs 315 and the bottom wall 317 can be formed by a flap made of polymer material with suitable thickness to form a sort of hinge.

[0104] The first end 315.1 of each rib 315 is constrained to the annular element 315.7 so as to allow the rib 315 to flex with respect to the annular element 315.7.

[0105] The annular element 315.7 is constrained to the external support 307 so as to allow the elastic deformation movements described above of the ribs 315 and of the elastic strips 311. Suitable connection members to the external support 307 are provided for this purpose. For example, in the embodiment illustrated in Figs. 22 to 28, the annular element 315.7 has a reversible fastening system to the external support 307. In the illustrated embodiment, the annular element 315.7 comprises radial appendages 315.8 which interlock in slits or slots 307.3 formed in the external support 307 (see in particular Figs.22, 25 and 28). Moreover, the external support 307 comprises an annular step 307.4 (see in particular Figs. 24 and 28) on which the annular element 315.7 rests.

[0106] Operation of the mop wringing device 305 described above is in substance the same as described previously, in particular with reference to the mop wringing device 5 of Figs. 1 to 7.

[0107] Besides the different fastening methods of the internal component 309 to the external support 307, the embodiment of Figs.22 to 28 differs from the embodiment of Figs. 1 to 7 also in other aspects, some of which are indicated below.

[0108] From its first end 311.1 each first portion 311.3 of each elastically deformable strip 311 extends initially downward and subsequently upward to the intermediate fold 311.5, forming a further fold 311.6 with a convexity facing the opposite side with respect to the intermediate curve or bend 311.5. In this way, the first portion 311.3 of the elastically deformable strips 311 takes an S shape, which facilitates deformation downward and toward the axis X-X when the user inserts the mop into the contraction volume VC thrusting it toward the bottom of the bucket 3 to which the mop wringing device is fitted.

[0109] Moreover, each rib 315 forms, starting from an intermediate position of its extension along the portion 315.4, a peak 315.6, which improves operation of the mop wringing device 305. Moreover, the ribs 315 are joined to one another by a ring 309.1.

Claims

1. A mop wringing device, comprising:

- an external support adapted to be fixed to a bucket, comprising an annular body and a plurality of elastically deformable strips, each having a first end joined to the annular body and a second end joined to a bottom element of the external support;
- an internal component, housed coaxially in the external support and movable with respect to the annular body of the external support in a direction parallel to an axis of the external support and of the internal component; wherein the internal component comprises a plurality of ribs arranged around the axis and forming a contraction volume for the insertion of a mop, with a mouth and a bottom wall, to which respective ends of the ribs of the internal component are connected;

wherein each rib of the internal component is connected to the external support and co-acts therewith so that a thrust of a mop inserted into the contraction volume causes a contraction movement of the ribs of the internal component toward the axis of the internal component, and hence a narrowing of the contraction volume defined by said ribs, and a flexural deformation of the elastically deformable strips of the external support; and wherein the flexural deformation of the elastically deformable strips of the external support causes an accumulation of elastic energy that generates a thrust of the elastically deformable strips of the external support on the internal component, in opposition to the contraction movement.

2. The device of claim 1, wherein the annular body, the elastically deformable strips and the bottom element of the external support are formed by a single block of plastic material.

3. The device of claim 1 or 2, wherein each elastically deformable strip of the external support has a first portion extending from the first end of the elastically deformable strip to an intermediate curve of the elastically deformable strip, and a second portion, inclined with respect to the first portion and extending from the intermediate curve to the second end of the elastically deformable strip; wherein the first portions

of said elastically deformable strips converge from the annular body toward the axis of the external support and toward the mouth of the contraction volume; and wherein the second portions of the elastically deformable strips converge toward the axis of the external support.

4. The device of claim 3, wherein the intermediate curves of the elastically deformable strips are arranged around the mouth of the contraction volume and have a convexity facing the outside of the contraction volume.
5. The device of claim 3, wherein the first portion of each elastically deformable strip comprises a fold between the first end of the elastically deformable strip and the intermediate curve; wherein the fold has a convexity facing opposite the convexity of the intermediate curve.
6. The device of one or more of the preceding claims, wherein each rib is constrained to the external support by means of a respective hinge defining a rotation axis of the rib with respect to the external support; wherein preferably: the rotation axis of each rib is oriented with respect to the axis of the external support and of the internal component, so that the movement of the rib during contraction of the contraction volume is radial and generates a radial thrust on the mop inserted into the contraction volume; or wherein the rotation axis of each rib is inclined with respect to the axis of the external support and of the internal component so that the movement of the rib generates a tangential thrust on the mop inserted into the contraction volume.
7. The device of one or more of claims 1 to 5, wherein the internal component comprises an annular element that joins first ends of the ribs of the internal component to one another, said annular element having connection members to the external support.
8. The device of one or more of the preceding claims, wherein the bottom wall of the contraction volume rests on the bottom element of the external support, so that an axial thrust on the internal component is transmitted from the bottom wall of the contraction volume to the bottom element of the external support.
9. The device of one or more of the preceding claims, wherein the ribs of the internal component and the bottom wall of the internal component are made of a single block of molded synthetic resin.
10. The device of one or more of the preceding claims, wherein each rib of the internal component comprises two segments; wherein the first segment extends

from a first end of the rib, constrained to the external support, to an intermediate curve of the rib; wherein the second segment extends from the intermediate curve of the rib to the bottom wall of the contraction volume; the first segments converging from the first end toward the axis of the internal component and the second segments converging from the second intermediate curve of the rib toward the axis of the internal component.

11. The device of one or more of the preceding claims, wherein the elastically deformable strips and the ribs have an upside-down V-shaped portion, with a vertex oriented toward the mouth of the contraction volume.
12. The device of one or more of the preceding claims, wherein the ribs are constrained to an annular body of the external support by means of a sliding or rotating coupling.
13. A mop wringing device, comprising:
 - an external support adapted to be fixed to a bucket, comprising an annular body and a plurality of elastically deformable strips, each having a first end joined to the annular body and a second end converging toward an axis of the device;
 - an internal component, housed coaxially in the external support and movable with respect to the annular body of the external support in a direction parallel to the axis of the device; wherein the internal component comprises a plurality of deformable ribs arranged around the axis and forming a contraction volume for the insertion of a mop, with a mouth and a bottom wall, to which respective ends of the ribs of the internal component are connected;

wherein, when a thrust is applied to the internal component, the ribs of the internal component and the elastically deformable strips of the external support and the ribs of the internal component are deformed with flexure from a condition at rest to a contracted condition, moving toward the axis and causing a reduction of the contraction volume, the elastically deformable strips of the external support forming an elastic return element, wherein potential energy is accumulated during deformation and which thrusts the internal component to return to the rest position.

14. A mop wringing device comprising an external support adapted to be fitted to a bucket and configured to house an internal component; wherein the internal component defines a contraction volume; wherein the external support comprises a plurality of elastically deformable strips and the internal component

comprises a plurality of ribs defining a contraction volume and constrained to the external support so as to be able to move with respect thereto; wherein the internal component and the external support are arranged and configured so that when a mop is inserted into the contraction volume and pushed toward the bottom of the bucket, the internal component and the external support contract accumulating potential elastic deformation energy and when the mop is removed, the external support returns to the condition at rest and pushes the internal component to expand toward the uncontracted condition of the contraction volume.

15. The device of claim 13 or 14, comprising the features of one or more of claims 1 to 12.
16. A kit comprising a bucket and a device as claimed in one or more of the preceding claims.

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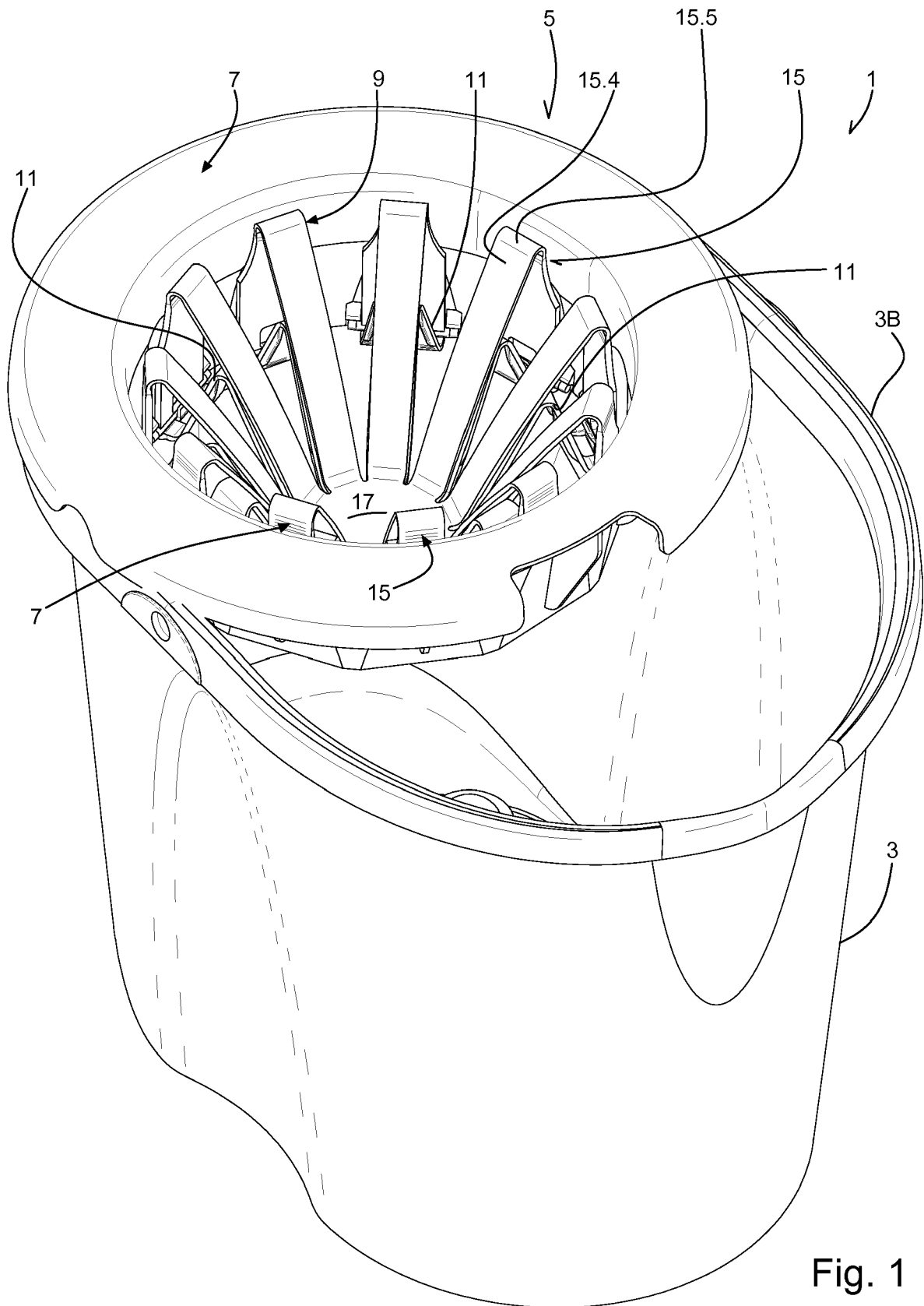
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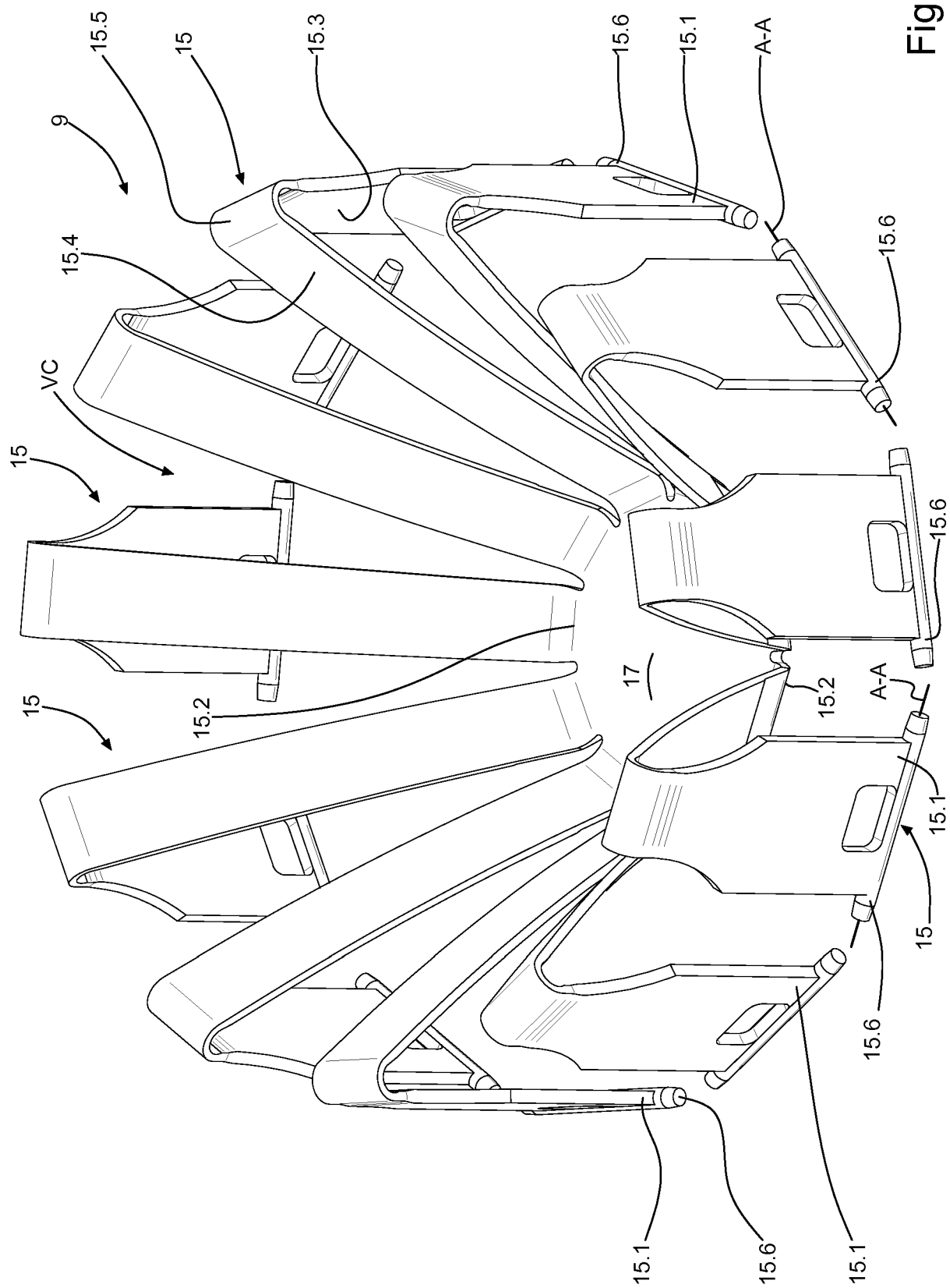


Fig. 2

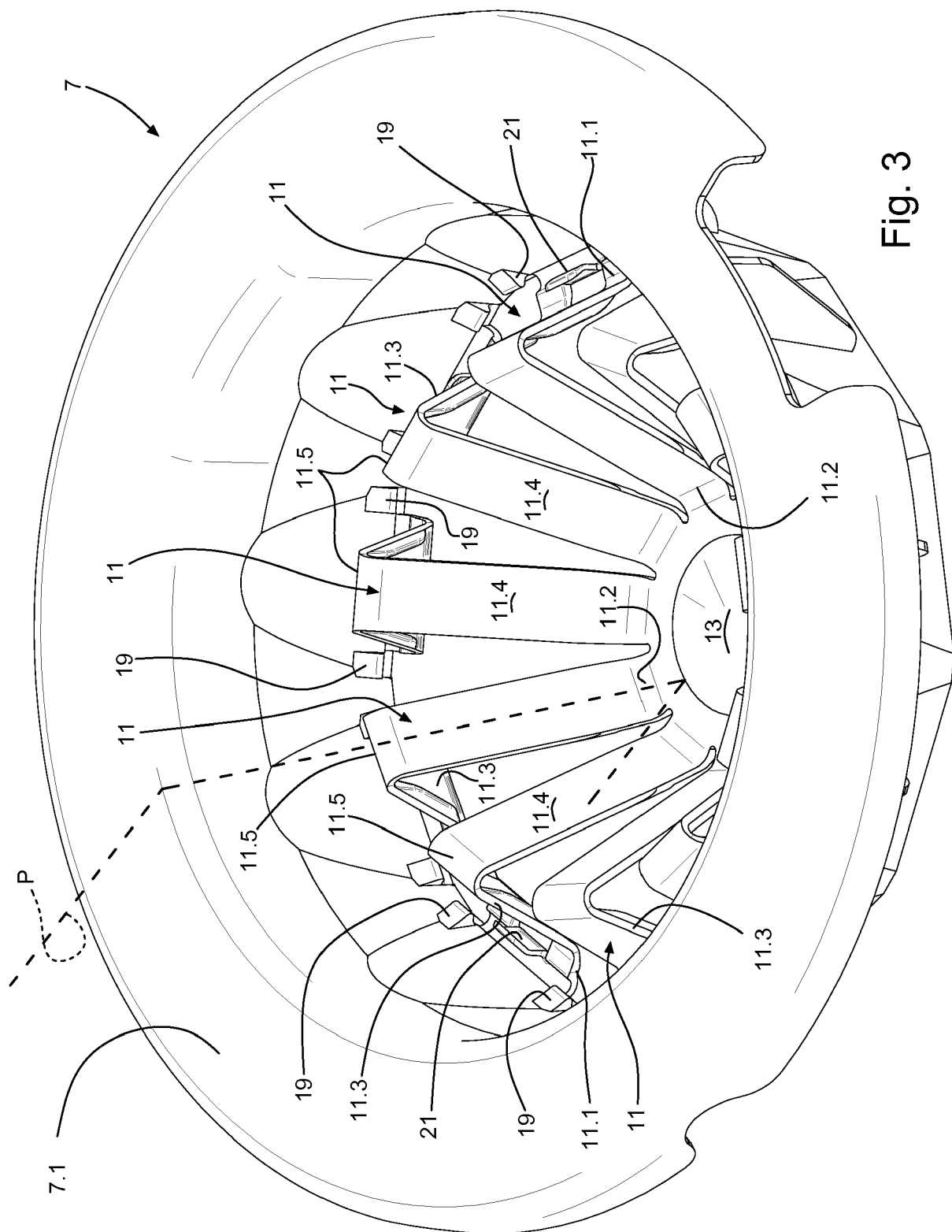


Fig. 3

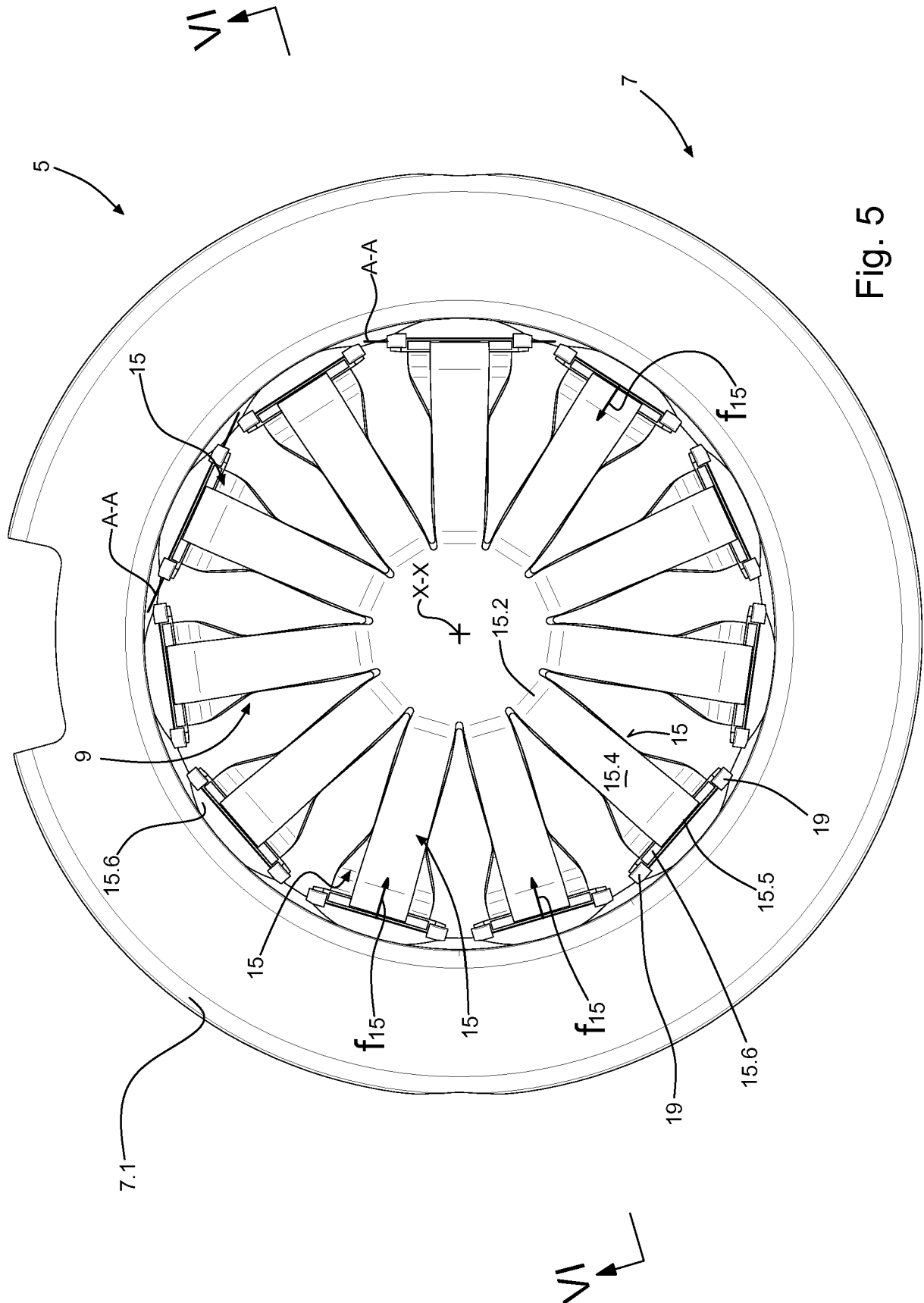
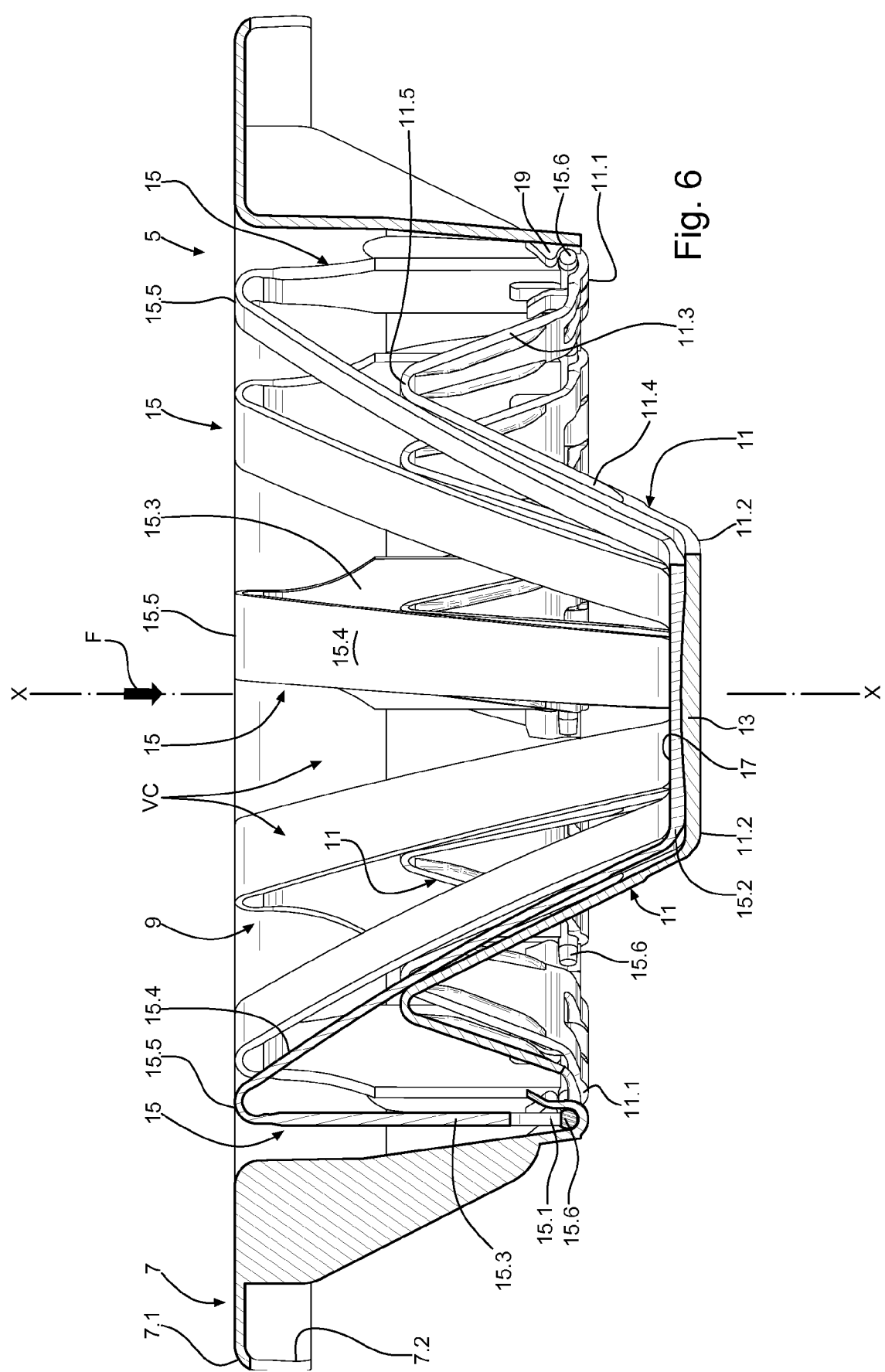
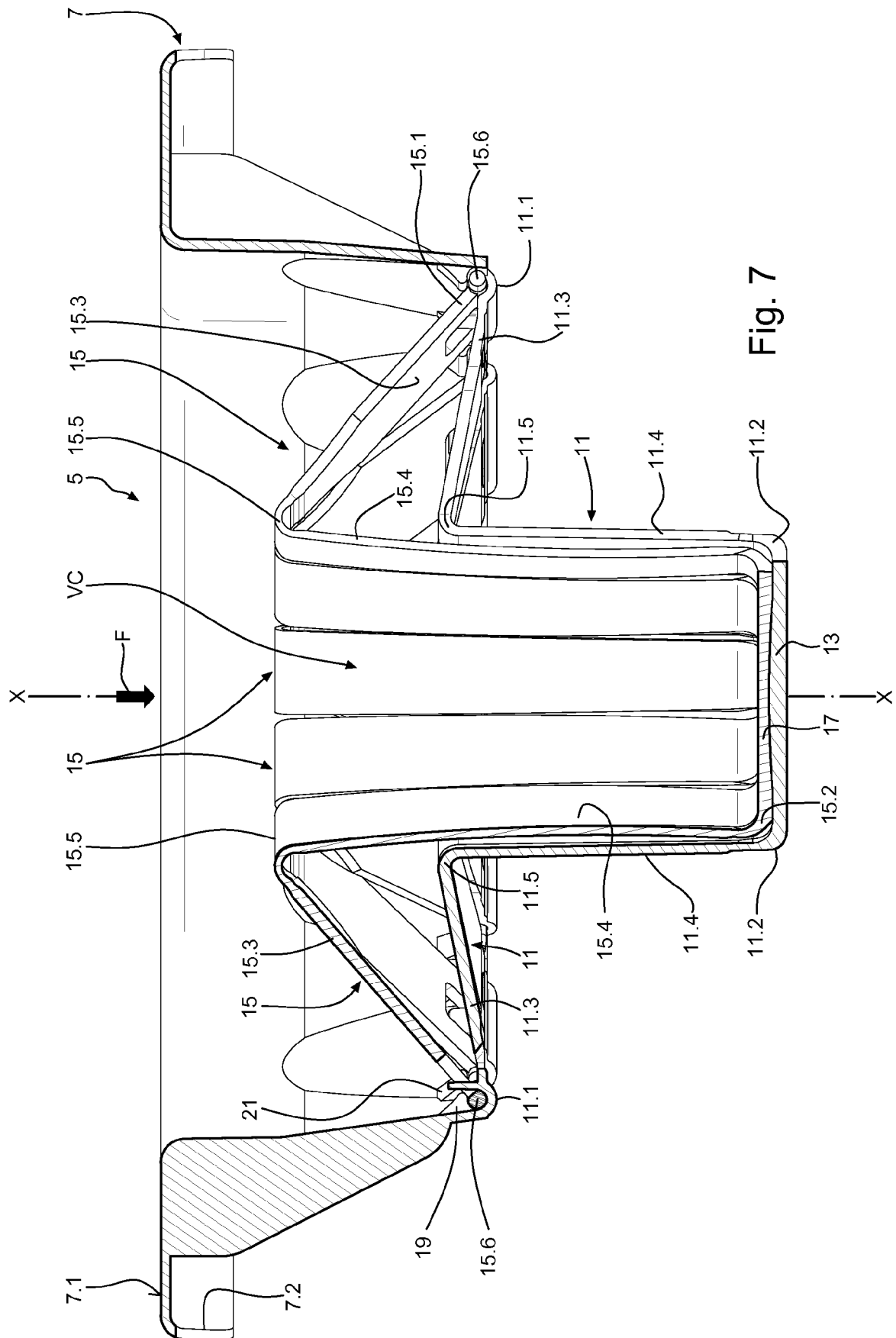


Fig. 5





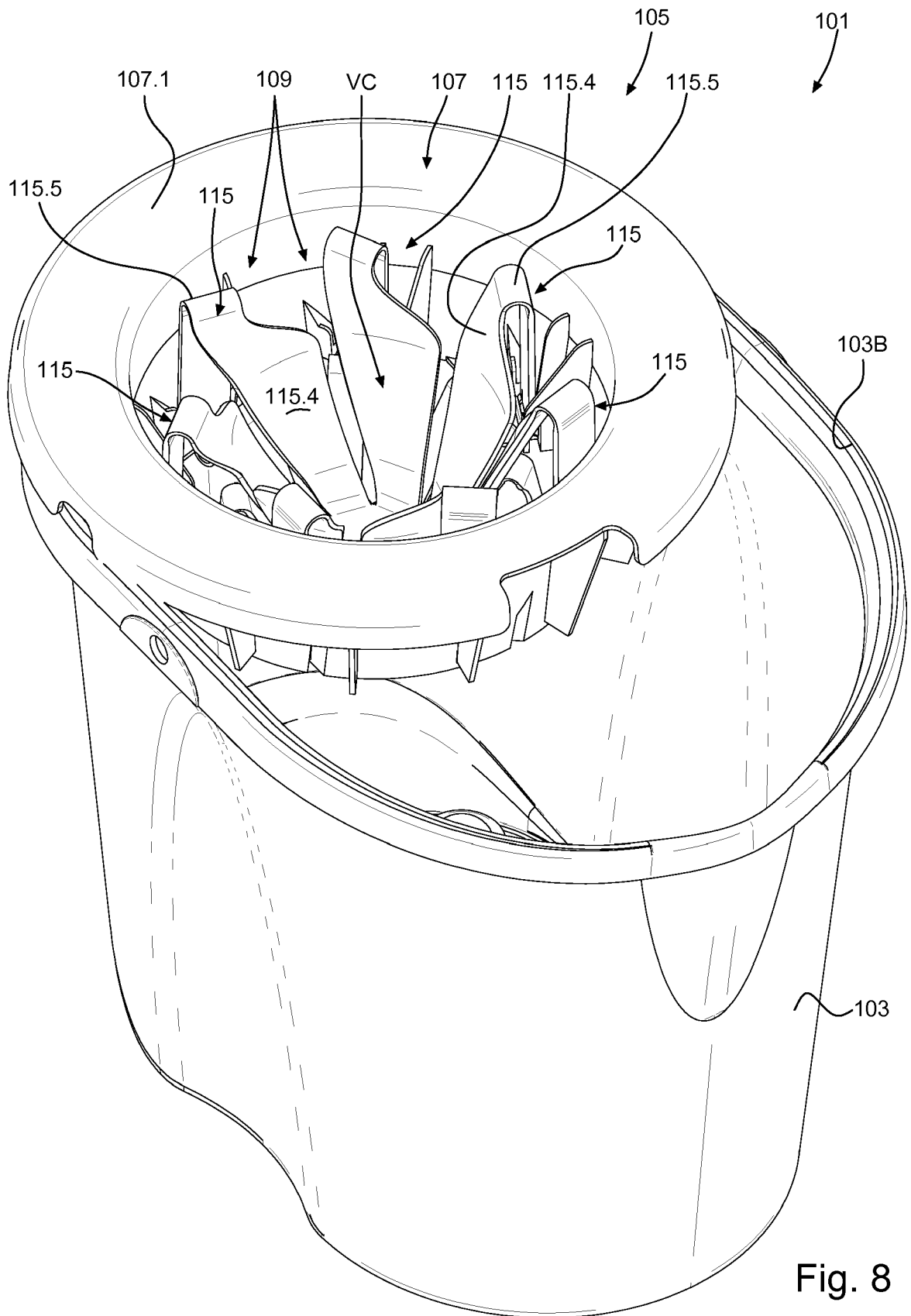


Fig. 8

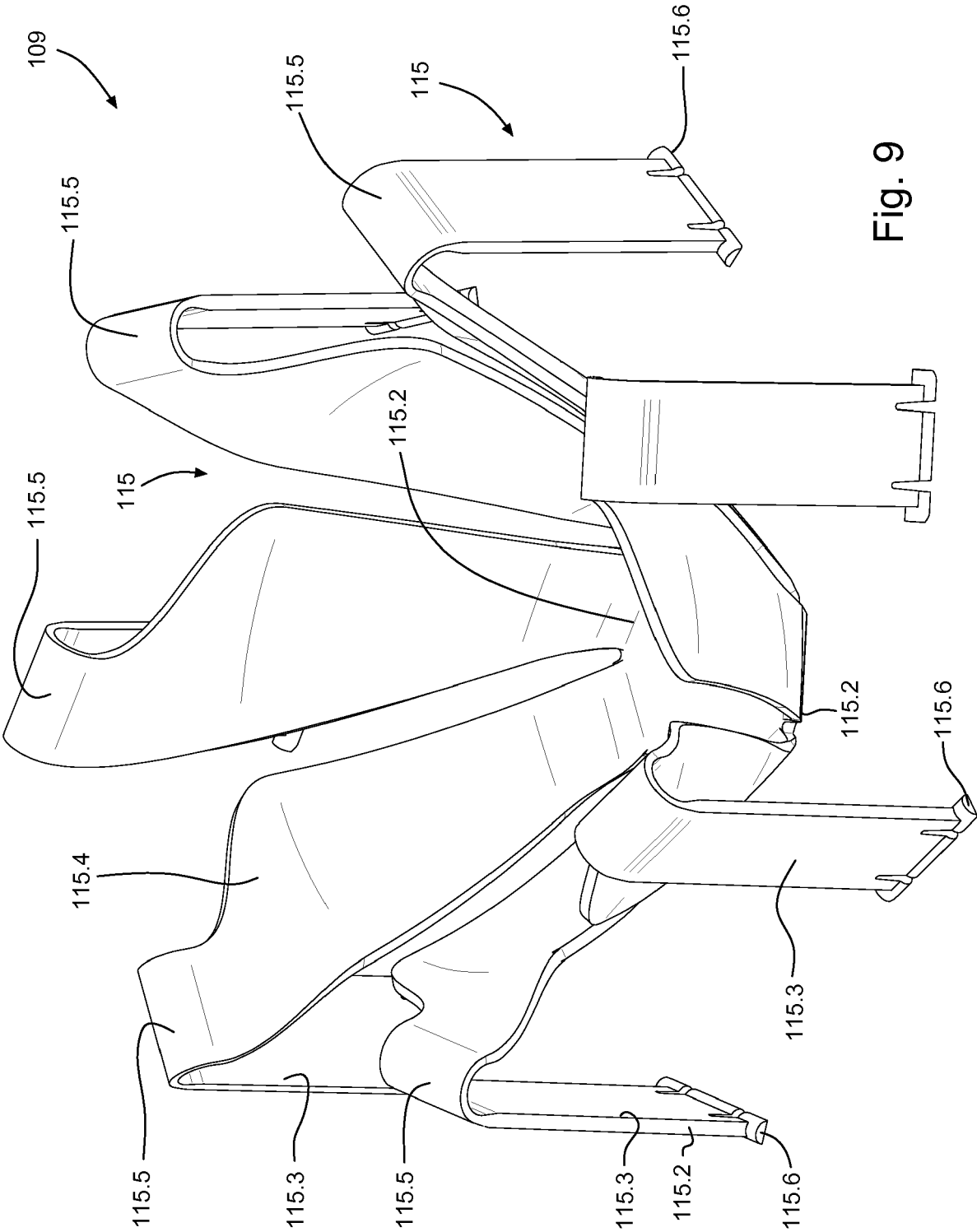


Fig. 9

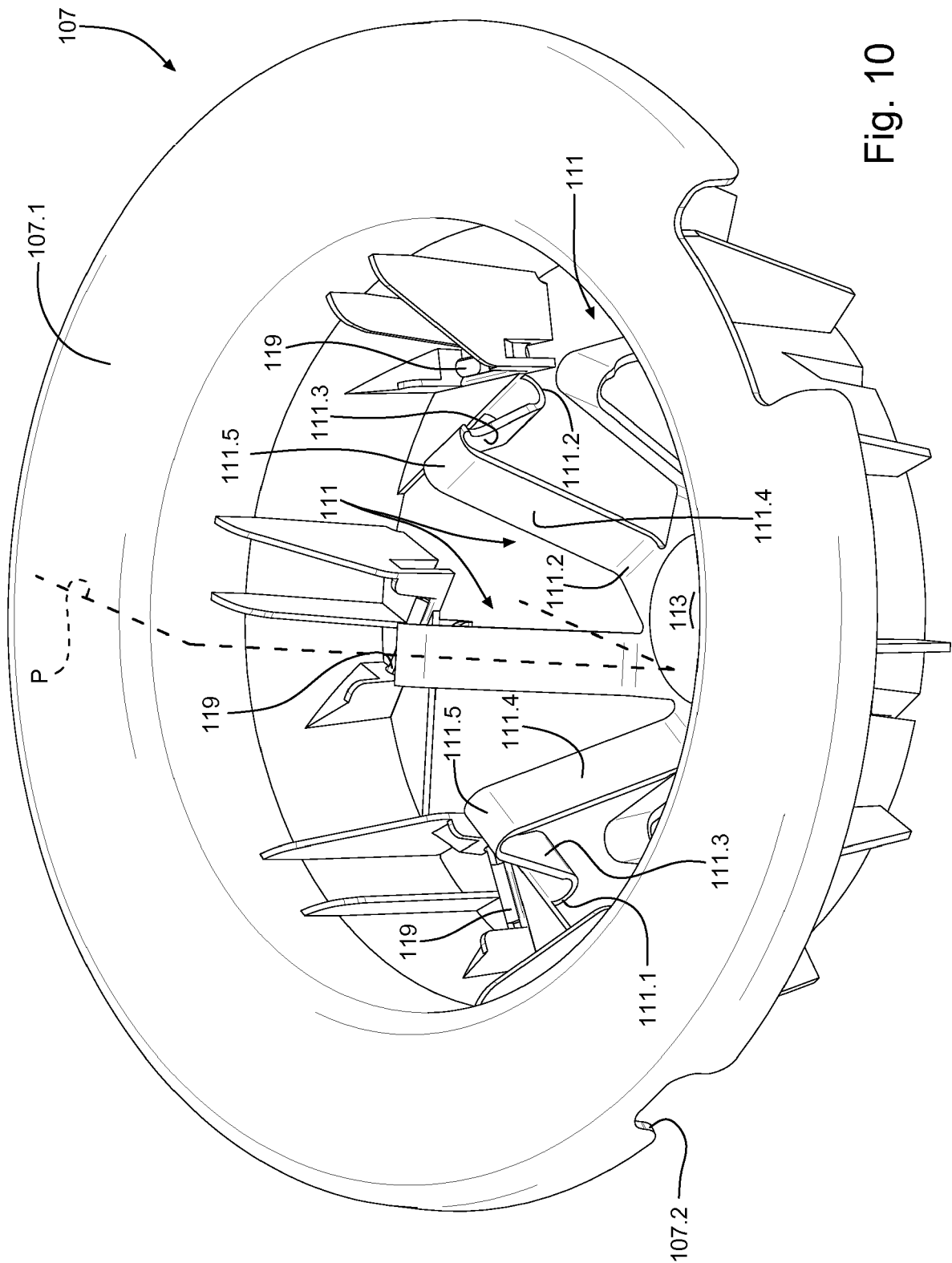


Fig. 10

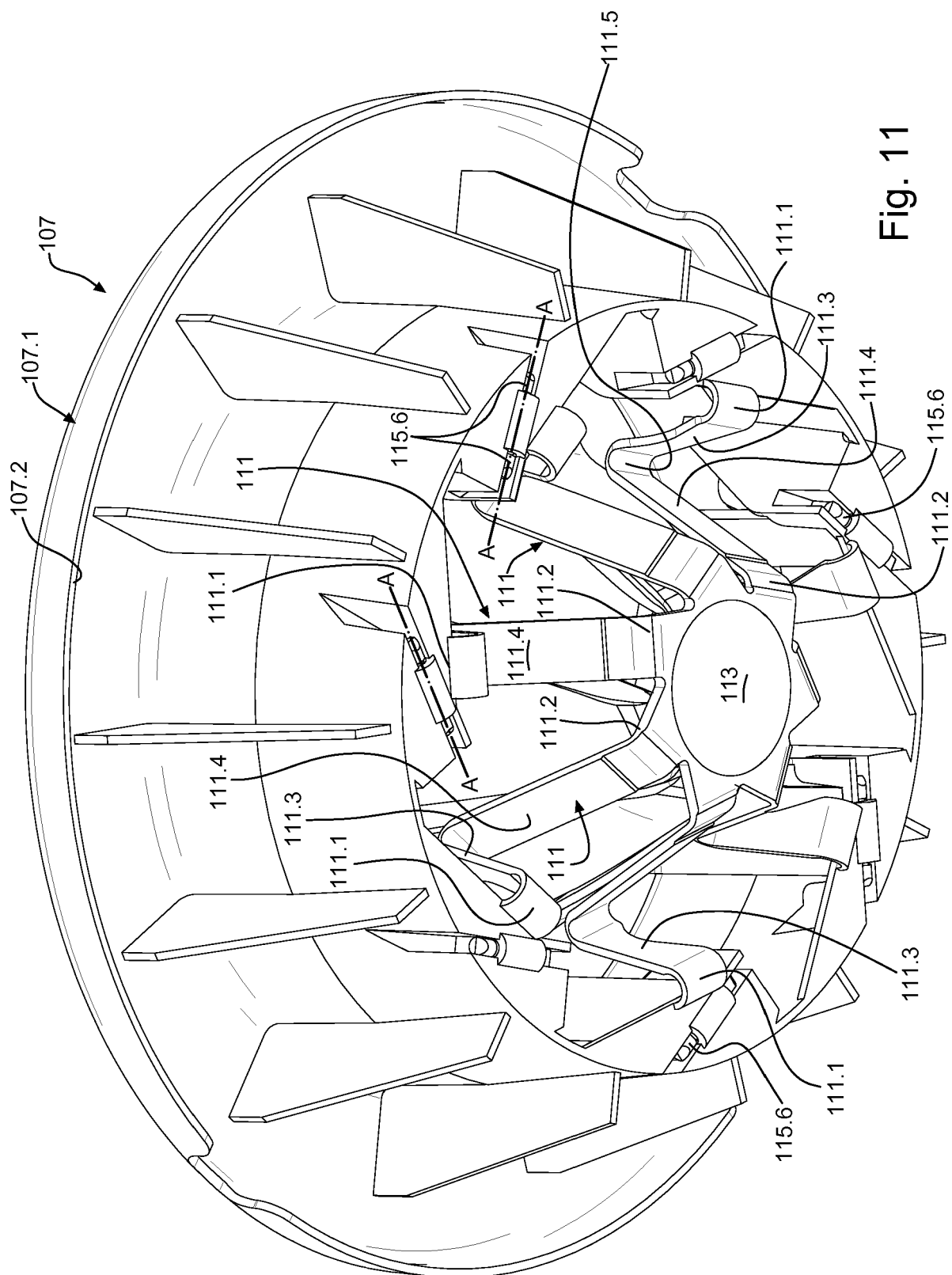


Fig. 11

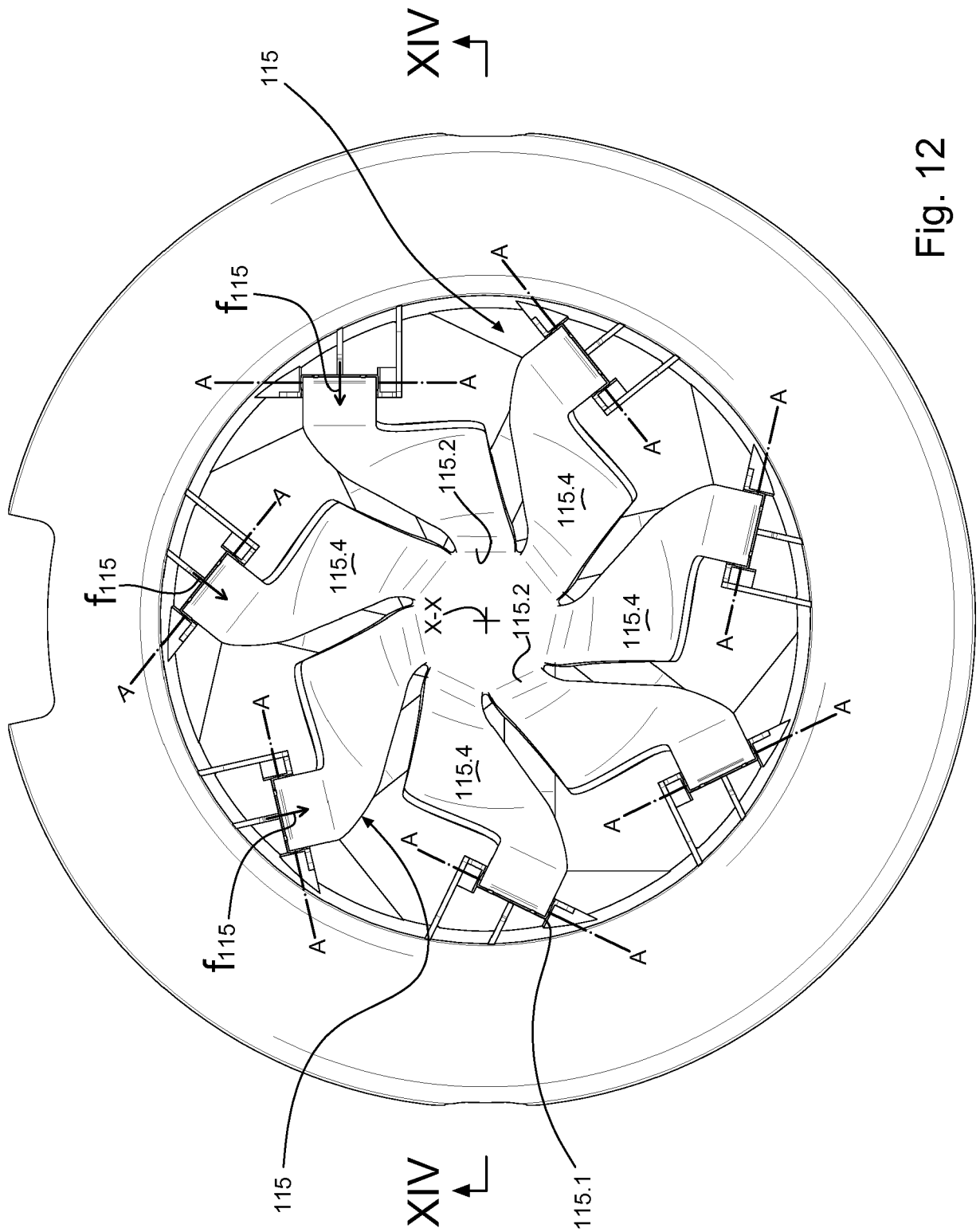


Fig. 12

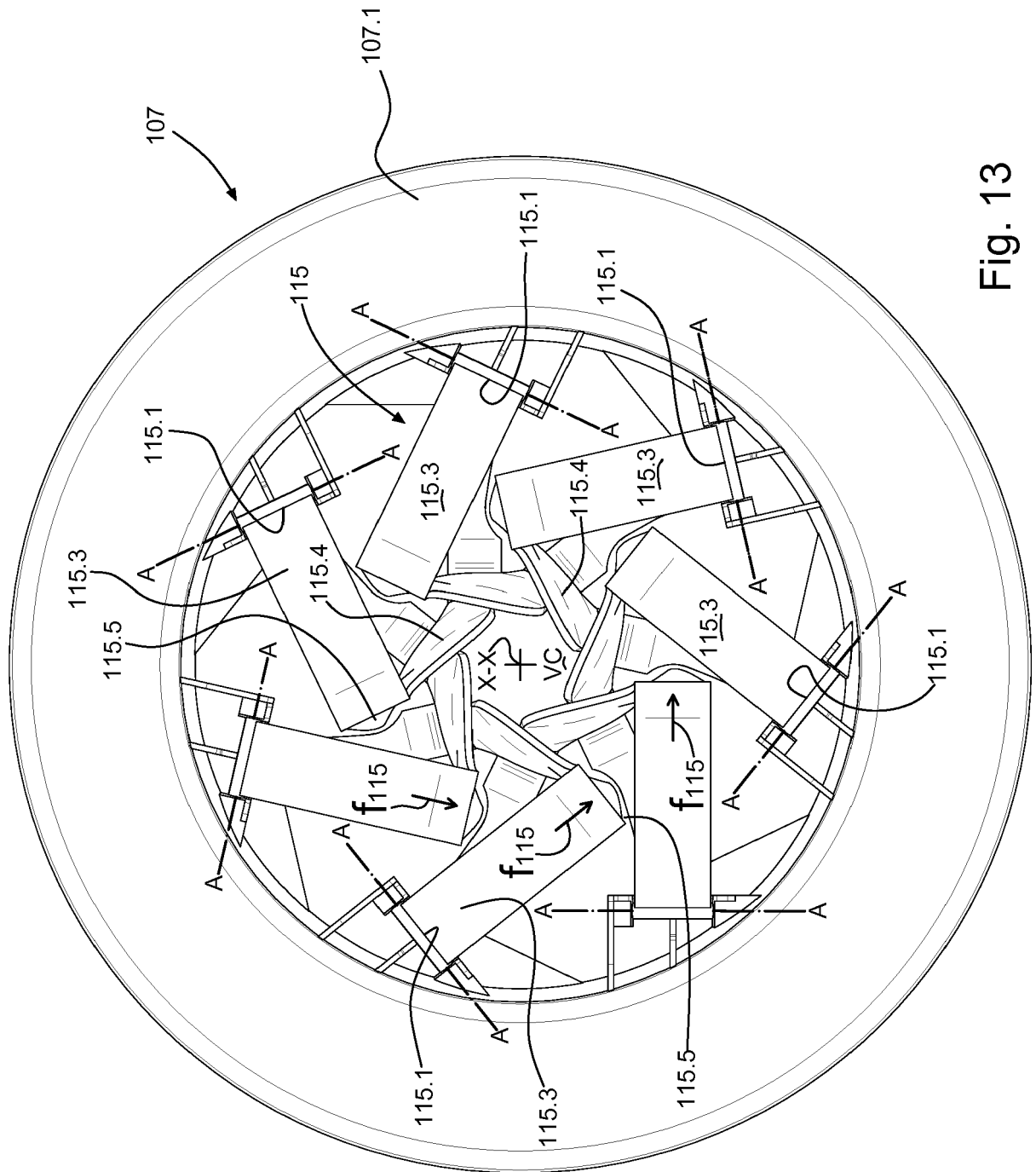


Fig. 13

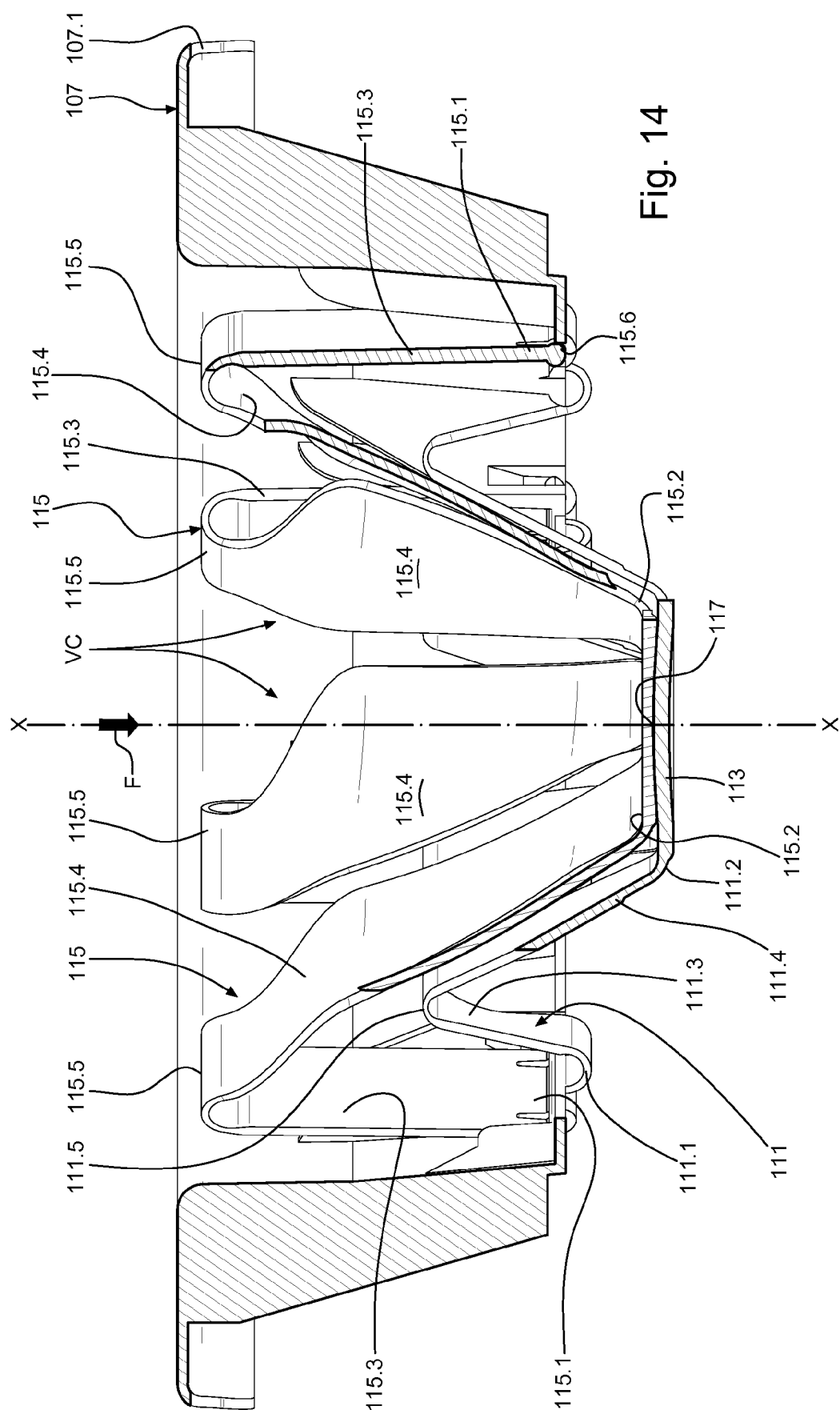
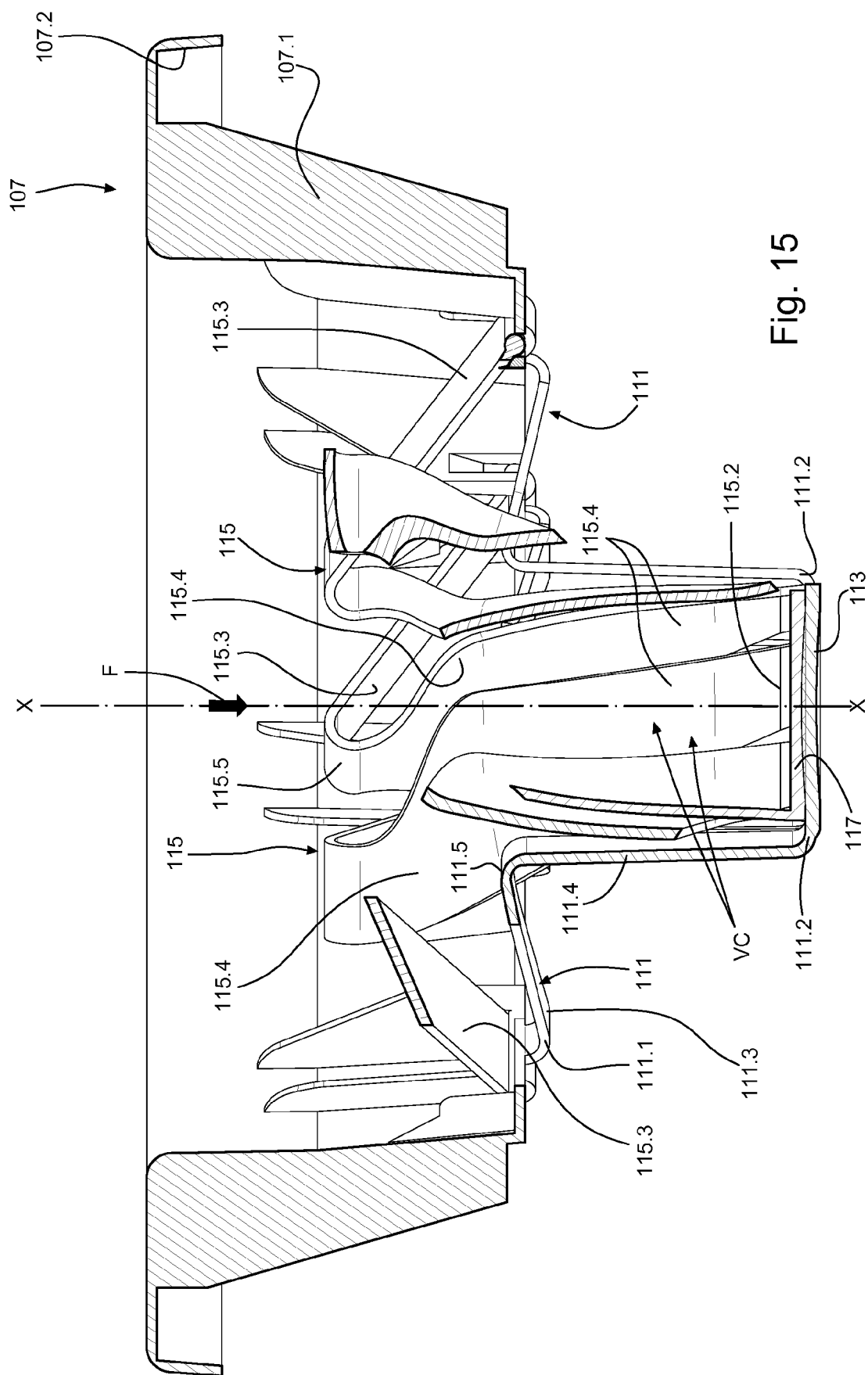


Fig. 14



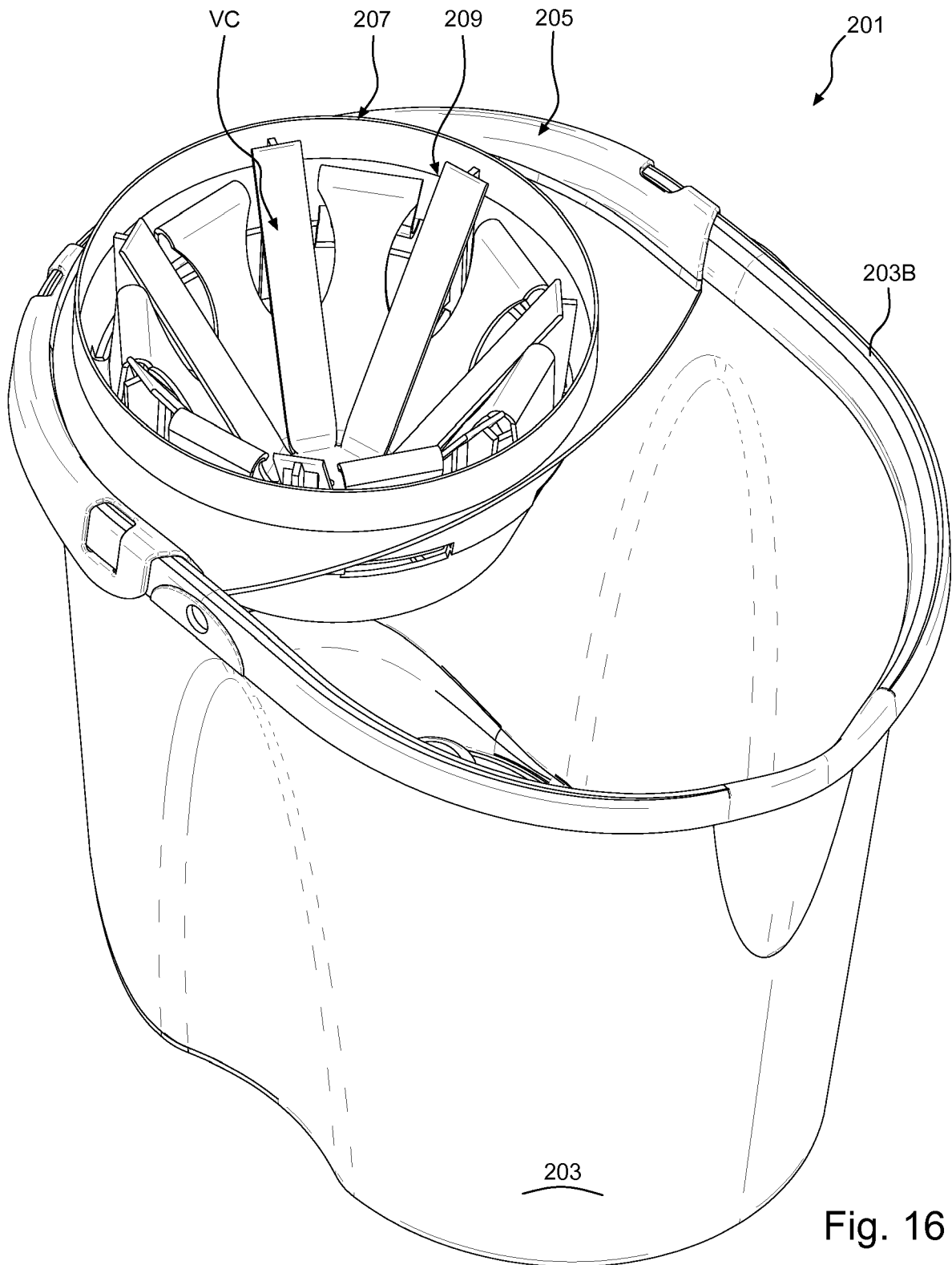
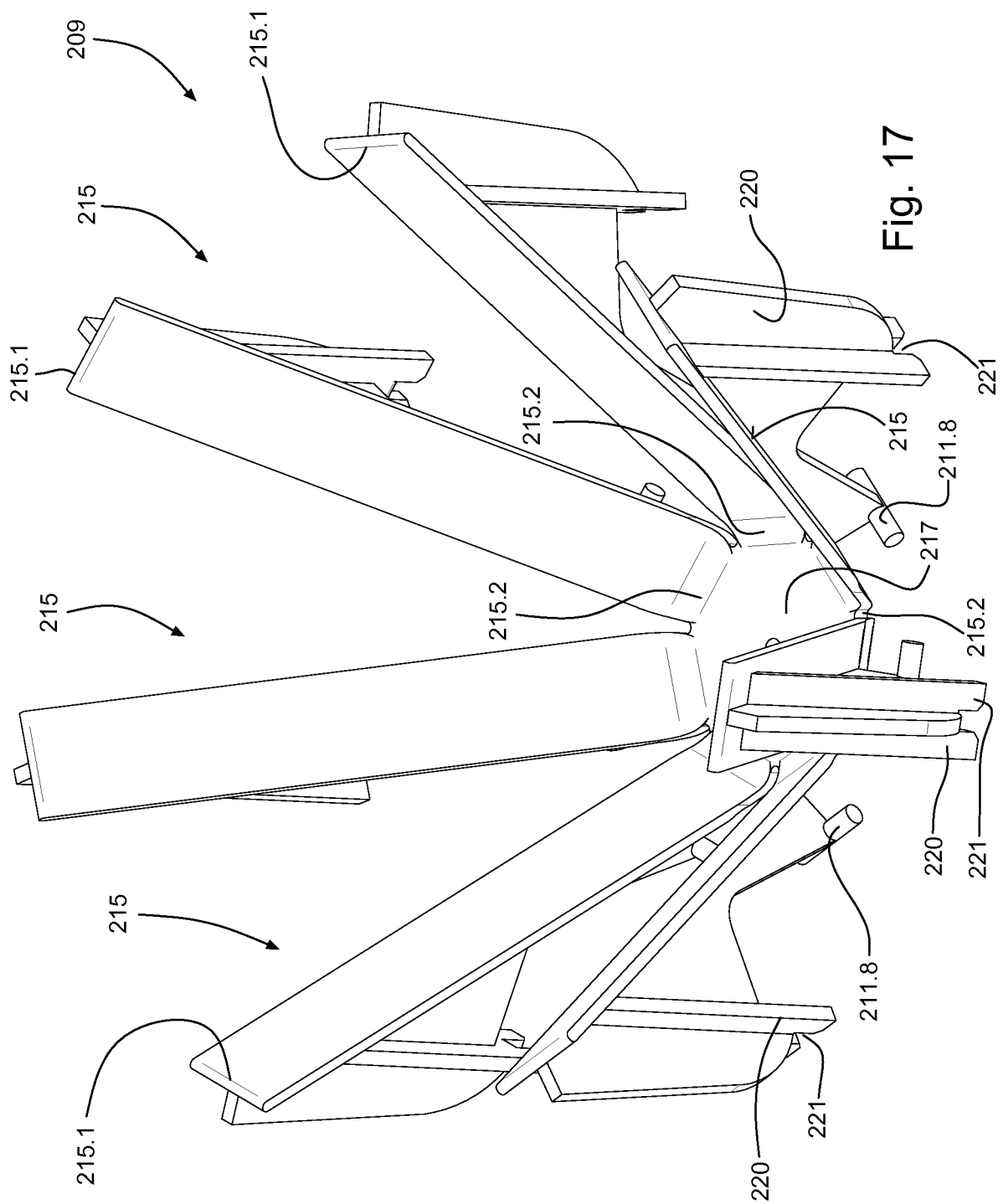


Fig. 16



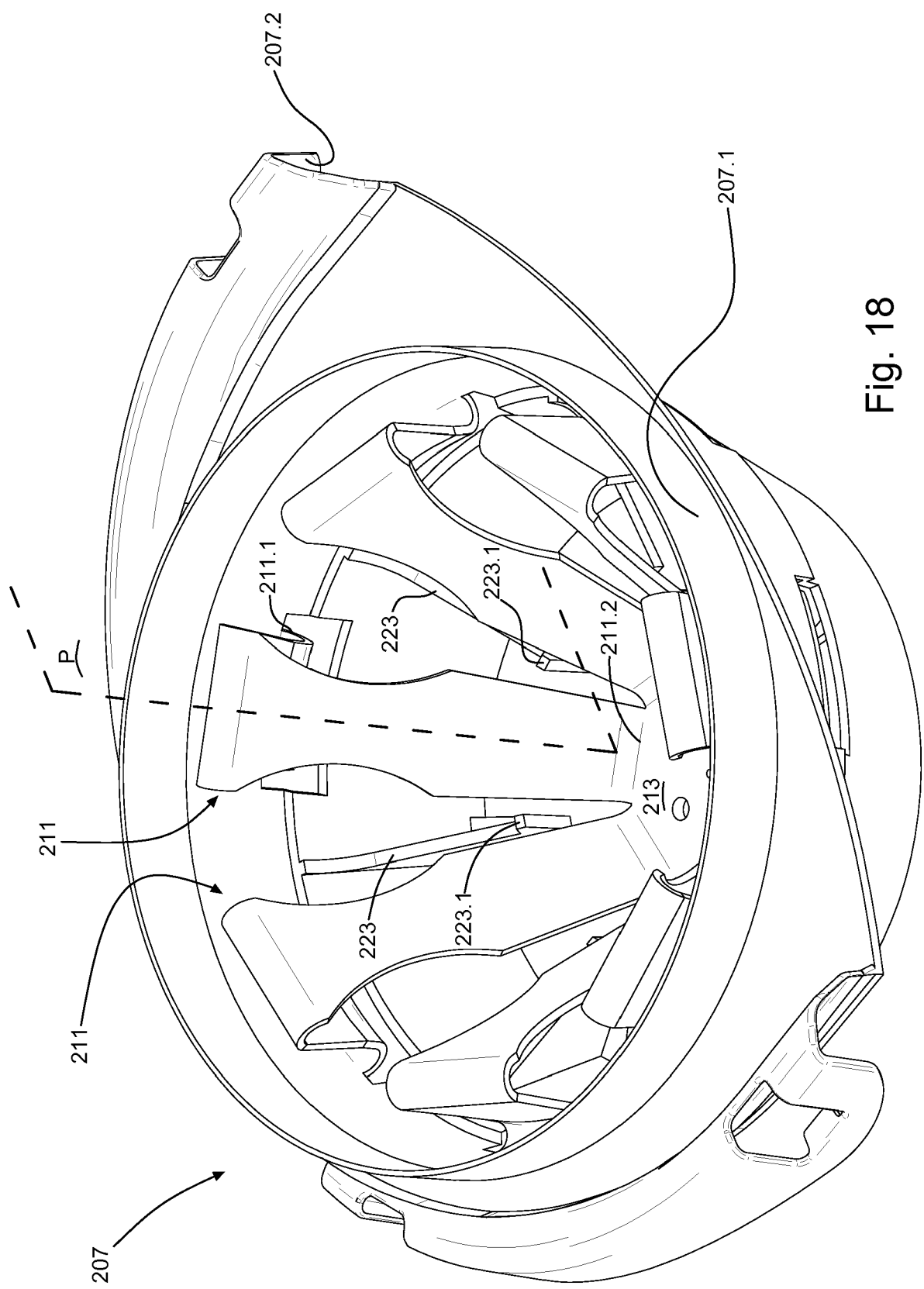


Fig. 18

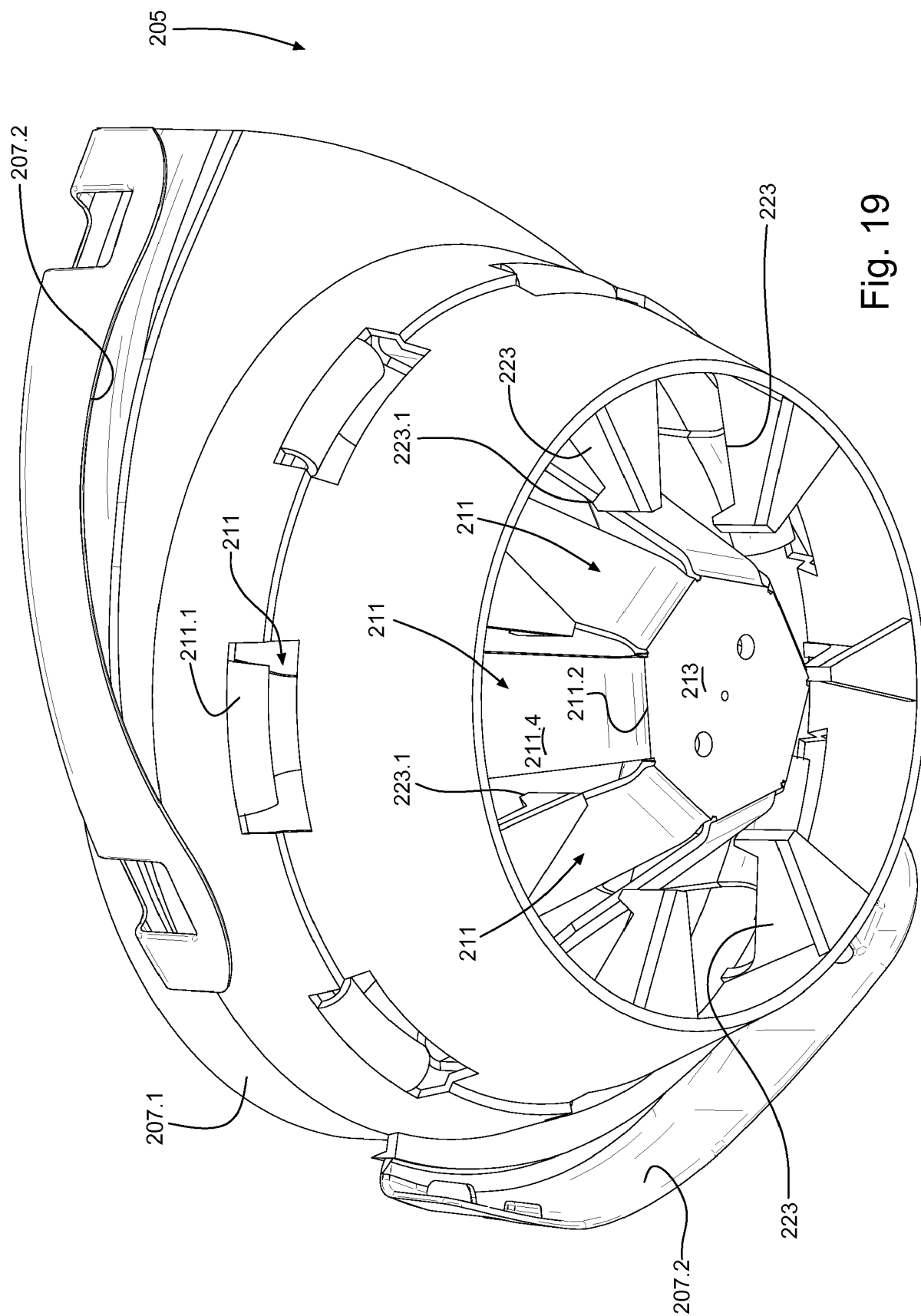


Fig. 19

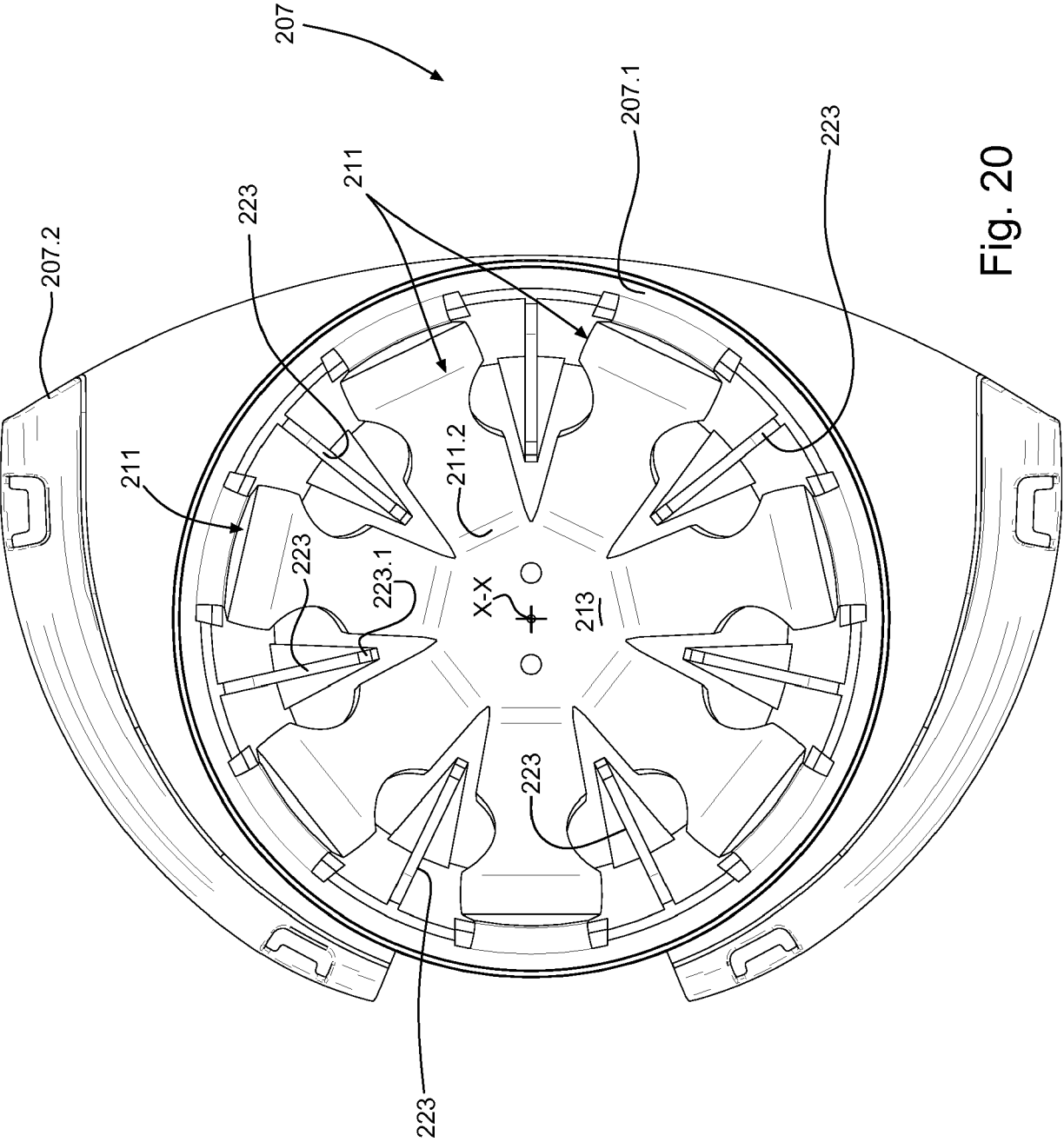


Fig. 20

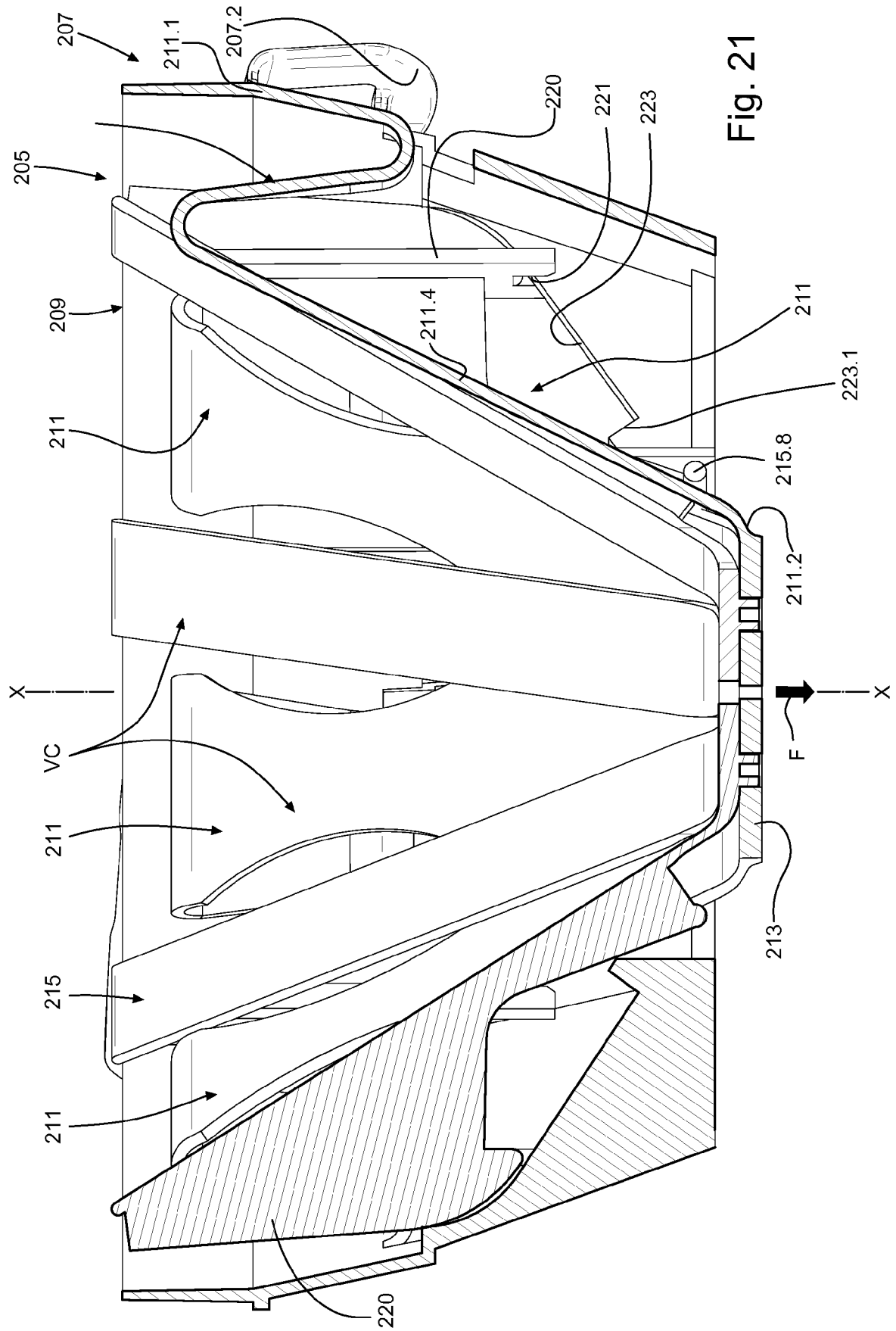


Fig. 21

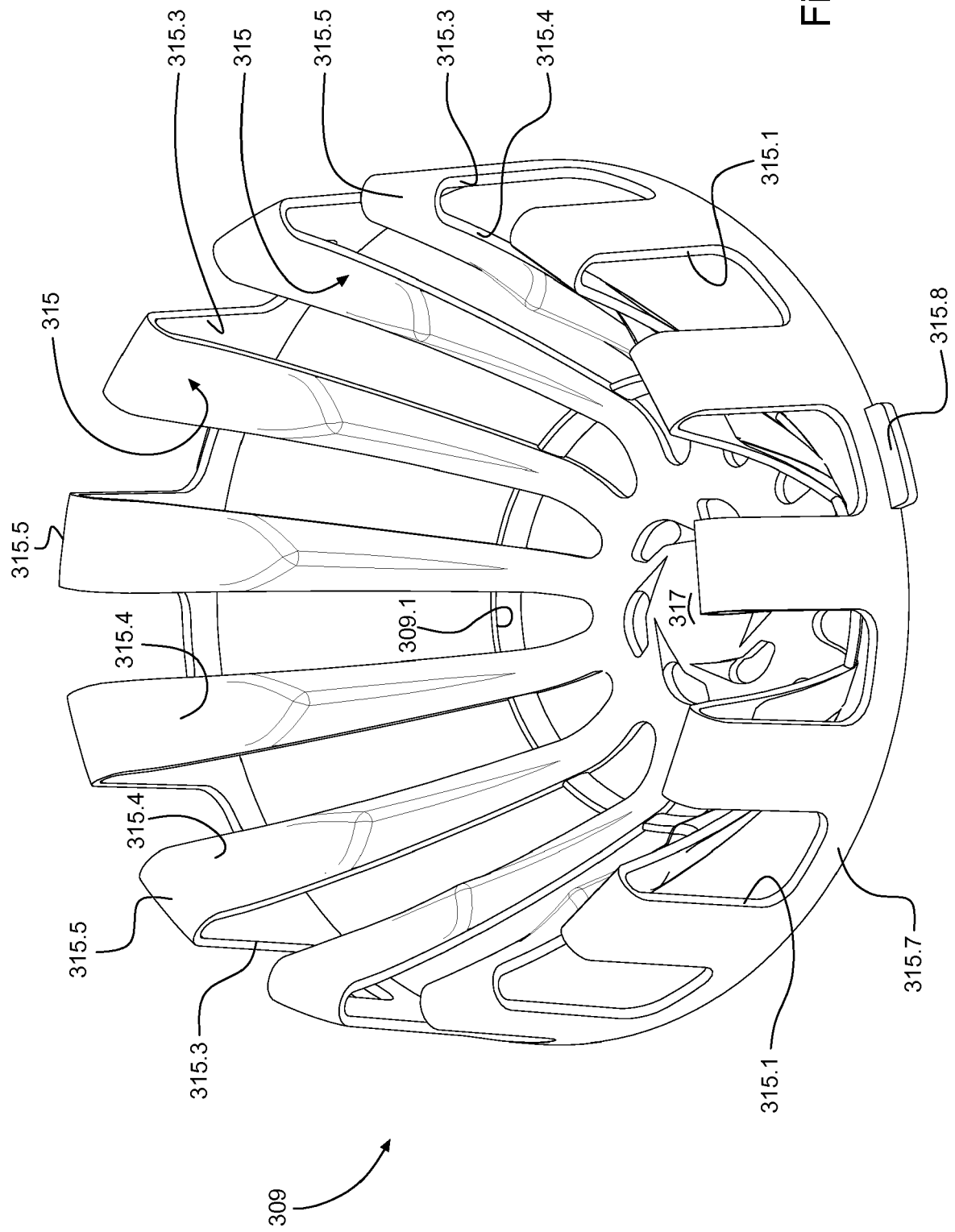


Fig. 22

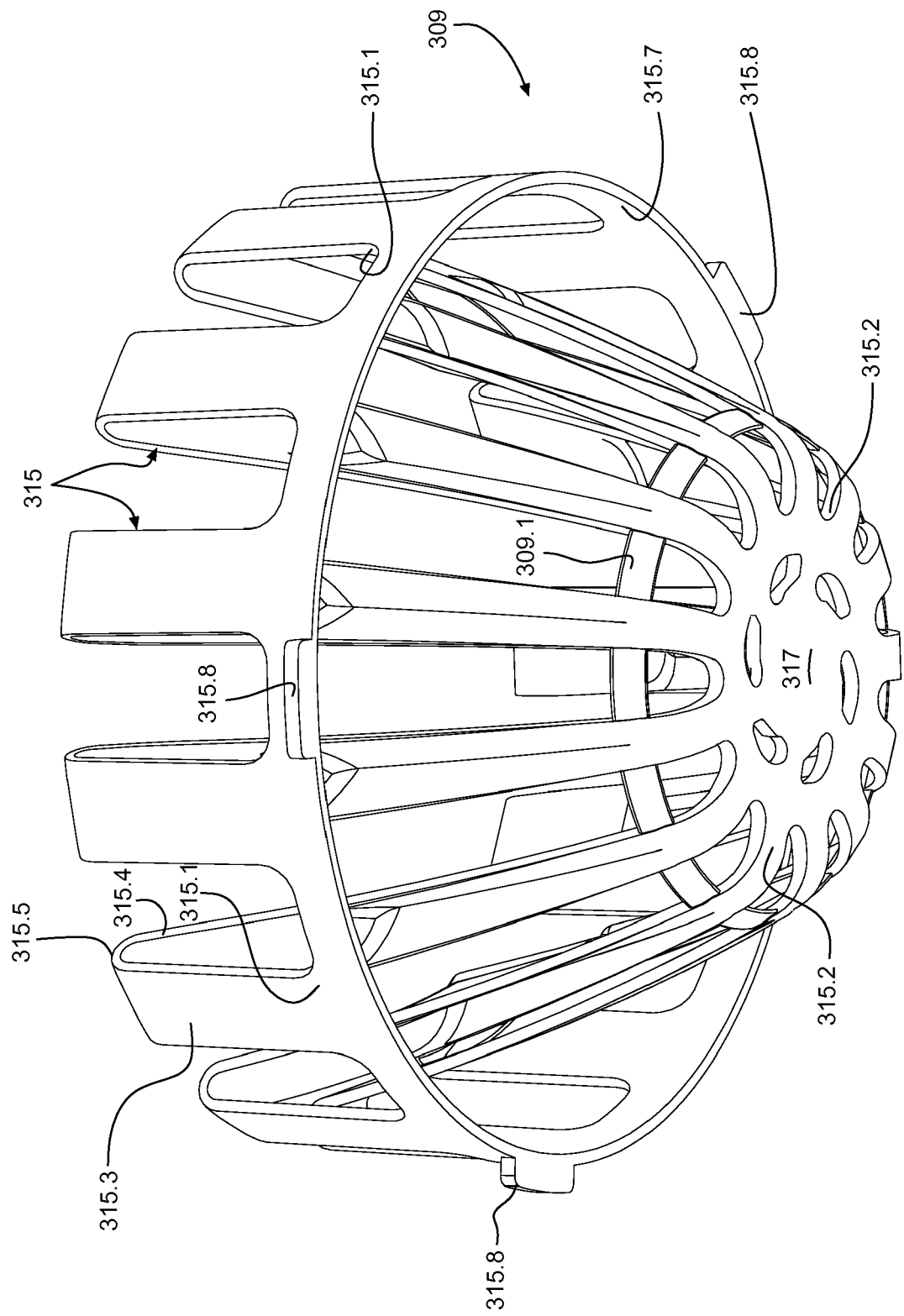


Fig. 23

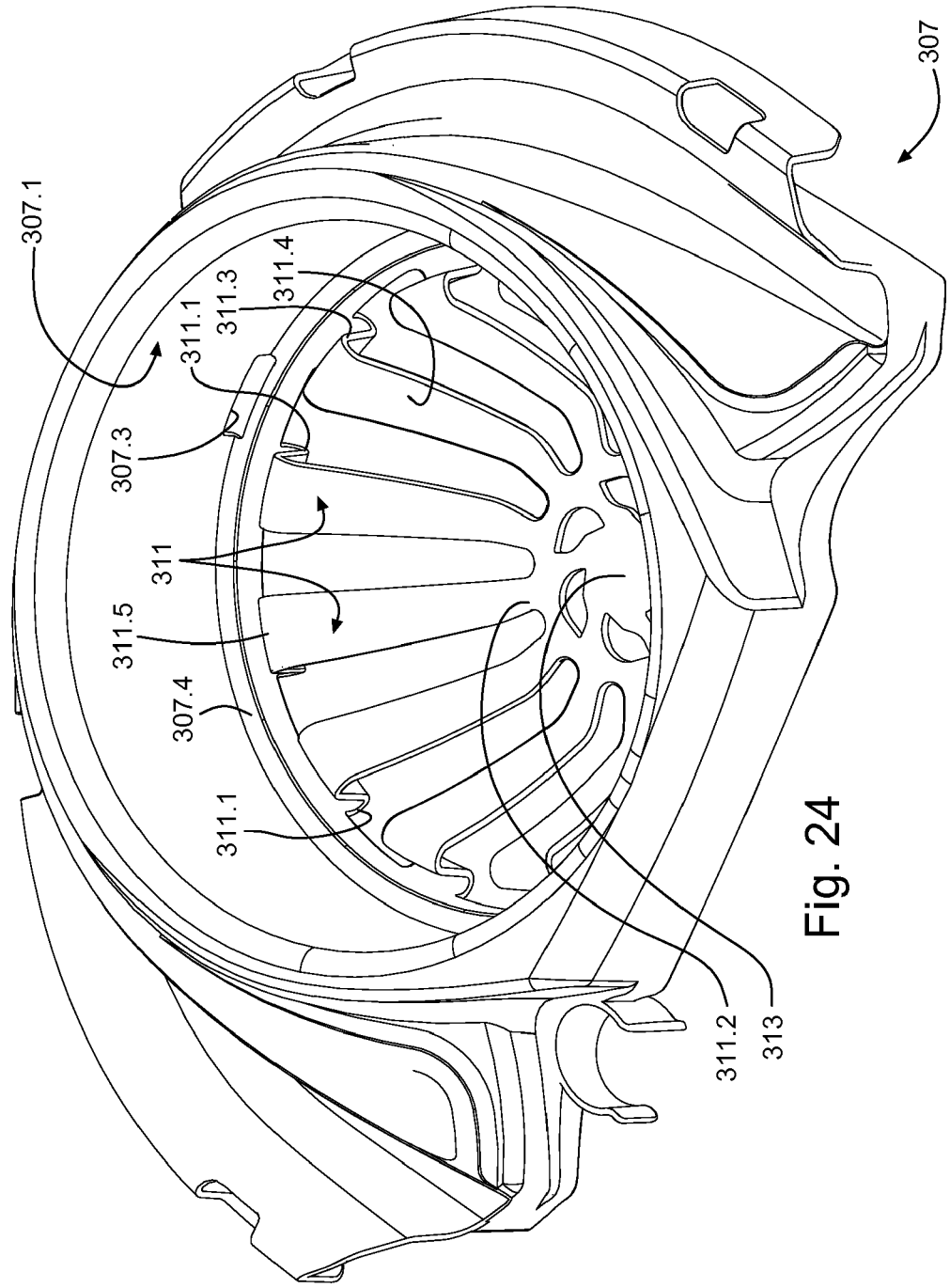


Fig. 24

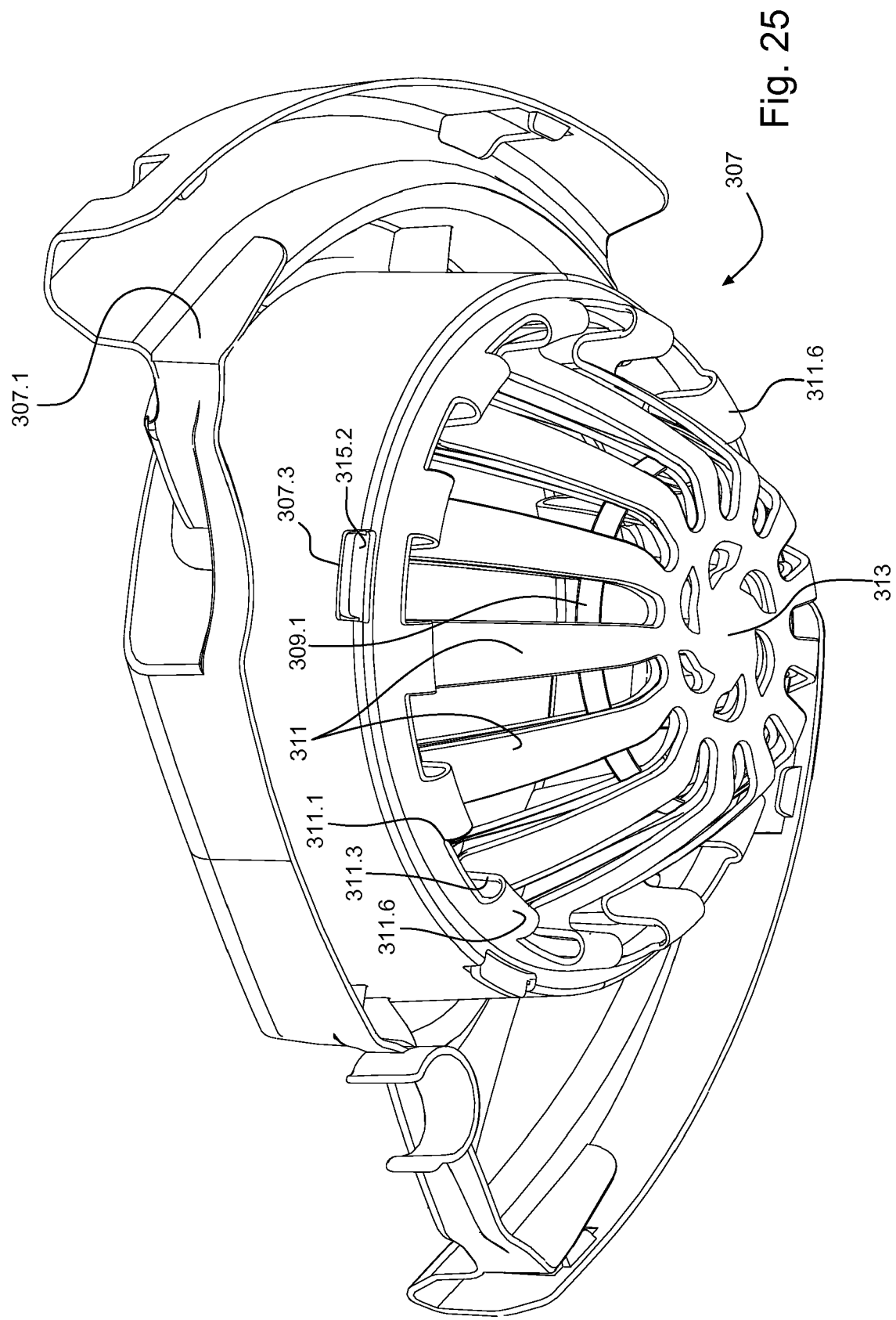
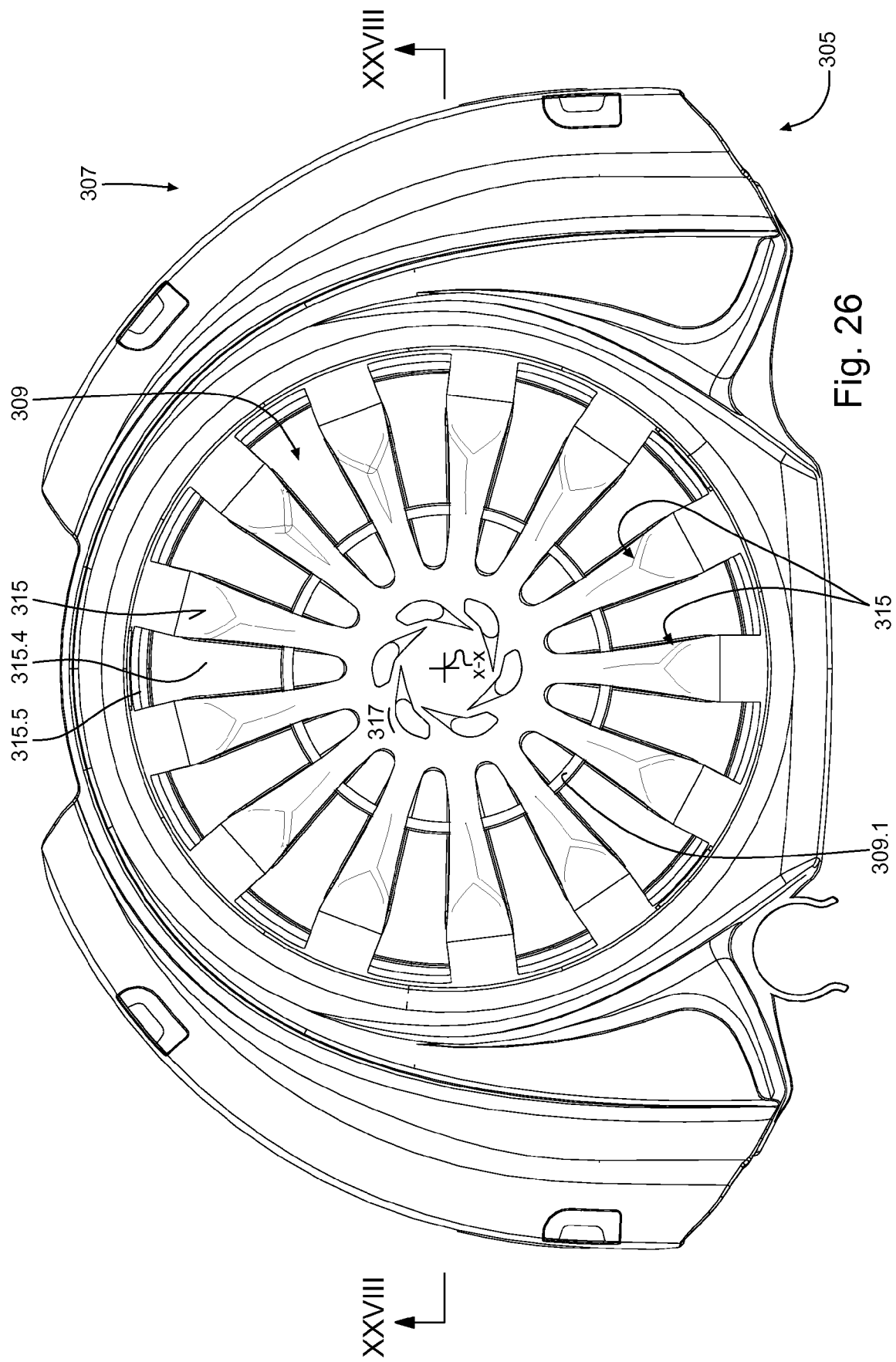


Fig. 25



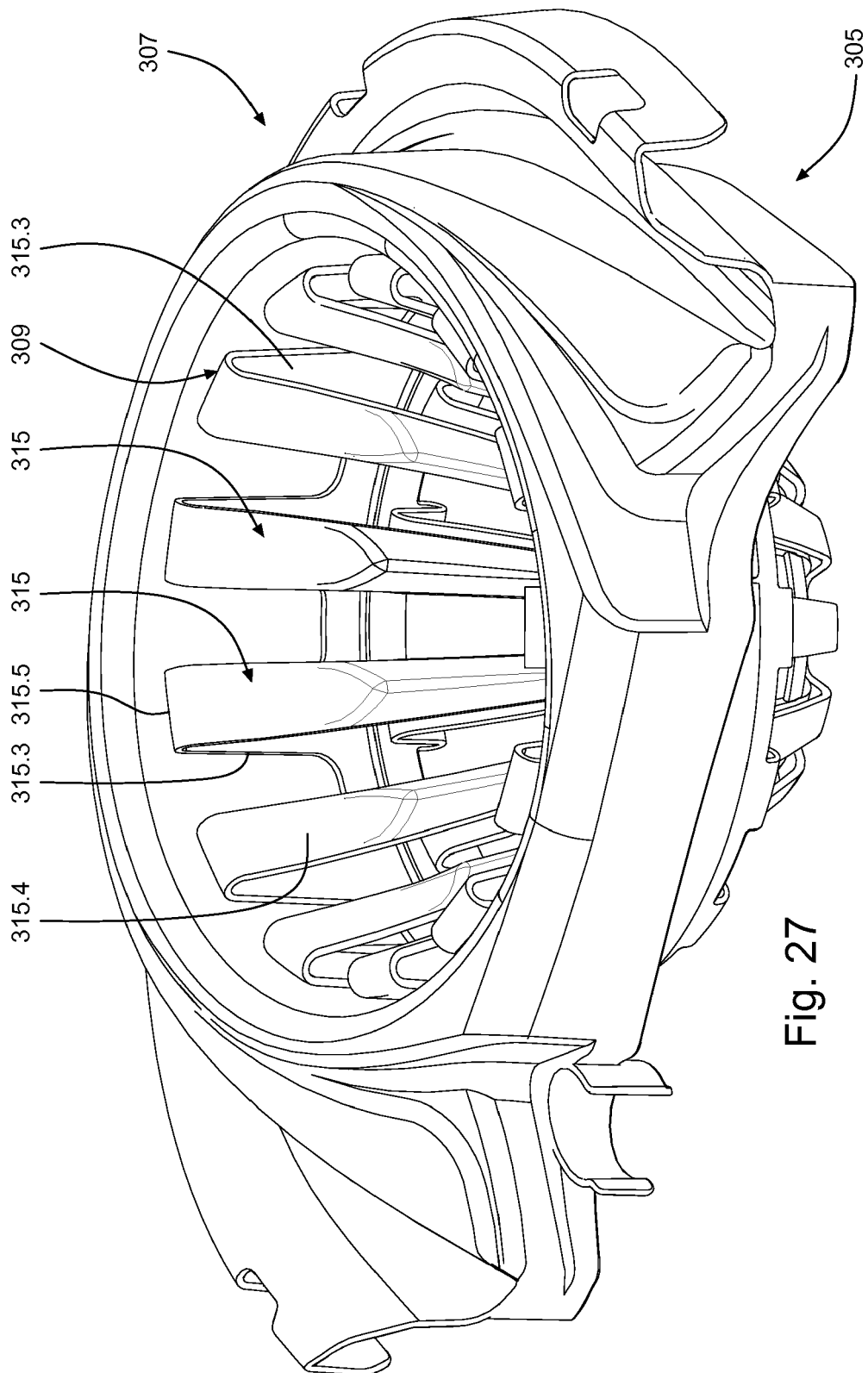


Fig. 27

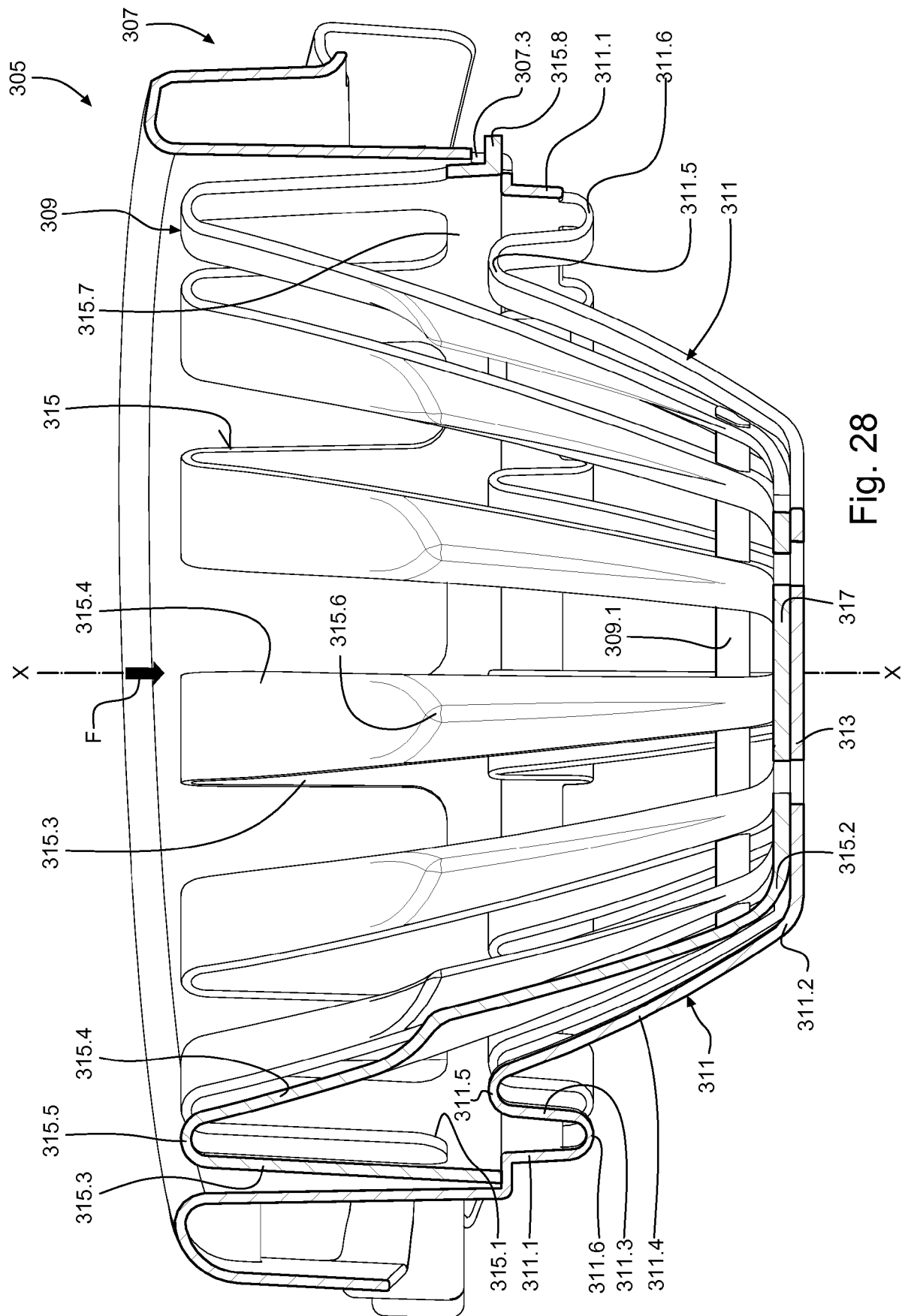


Fig. 28

REFERENCES CITED IN THE DESCRIPTION

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