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Meier et al.

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(54) **CHANNEL-RETAINING DEVICE, DRAINAGE SYSTEM AND METHOD**

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E03F 5/04 (2006.01)

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CPC ***E03F 5/04*** (2013.01); ***E03F 1/002*** (2013.01)

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CPC E01C 11/227; E03F 1/002; E03F 1/003; E03F 1/005; E03F 5/04; E03F 5/0401; E03F 3/046; E03F 2005/0415
See application file for complete search history.

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(74) *Attorney, Agent, or Firm* — Chrisman Gallo Tochtrop LLC

(57) **ABSTRACT**

According to different embodiments, a channel-retaining device (**200**) can comprise: a retaining holder (**102**), which has a first coupling region (**102***k*) and a retaining region (**102***a*) for retaining a drainage channel extending in a direction; a retaining socket (**104**), which has a second coupling region (**104***k*); wherein the first coupling region (**102***k*) and the second coupling region (**104***k*) form, when joined together, a joint (**106**), which provides the retaining holder (**102**) and the retaining socket (**104**) with a rotational degree of freedom (**111**) relative to each other in the direction; a locking device (**108**), which is designed to block the rotational degree freedom (**111**) when the locking device is placed in a first state, so that the retaining holder (**102**) and the retaining socket (**104**) are locked to each other, and designed to release the rotational degree freedom (**111**) when the locking device is placed in a second state, so that the retaining holder (**102**) and the retaining socket (**104**) can be moved relative to each other.

17 Claims, 25 Drawing Sheets

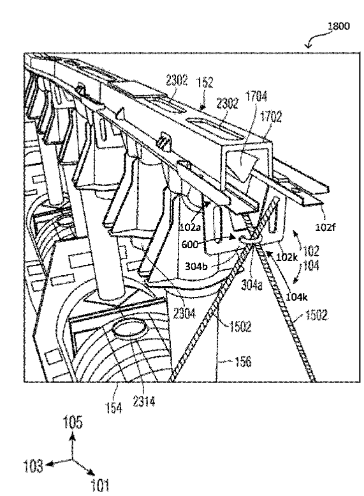

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FIG. 1

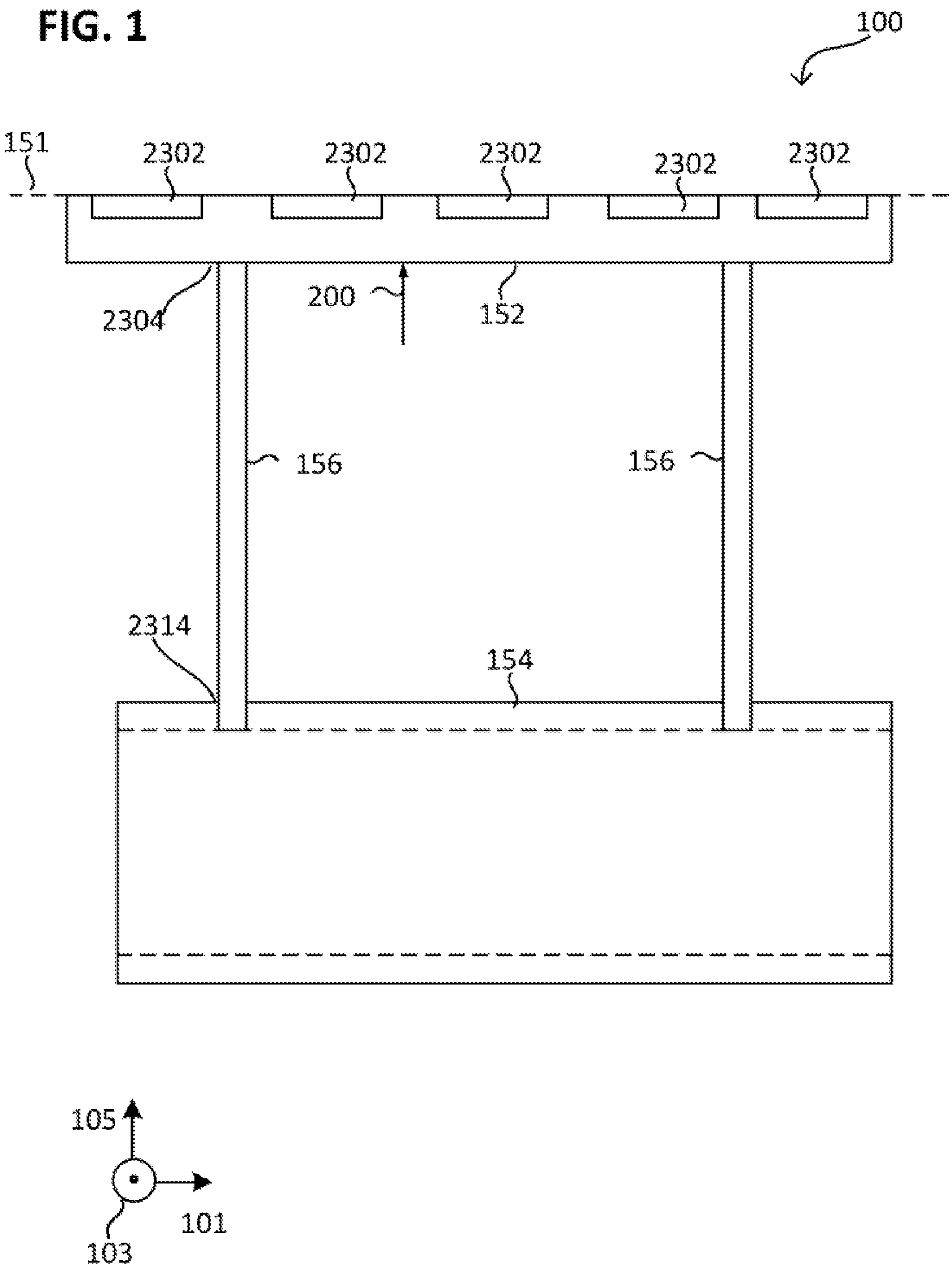

100
151
2302
2302
2302
2302
2302
2304
200
152
156
156
2314
154
105
103
101

FIG. 2

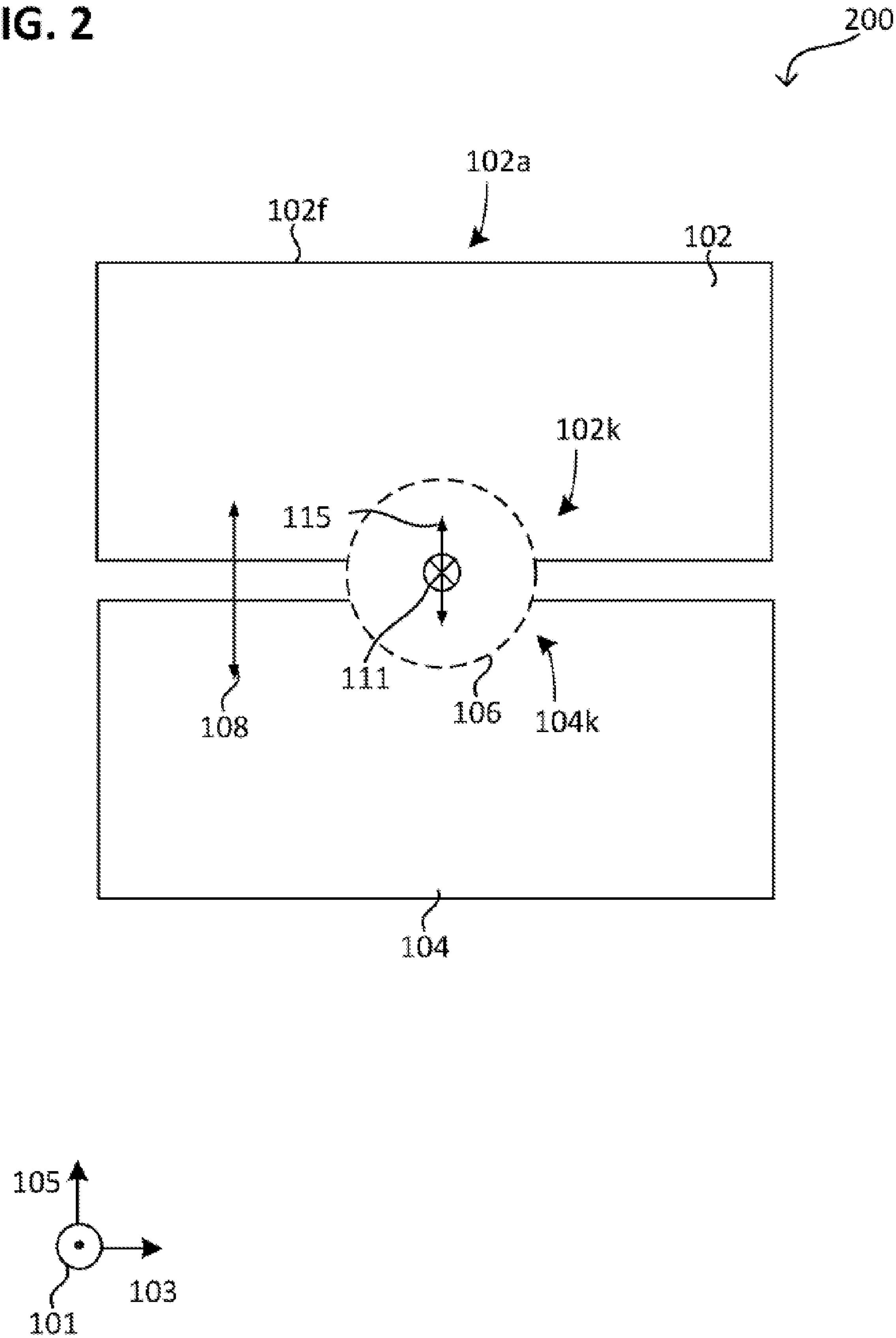


FIG. 3

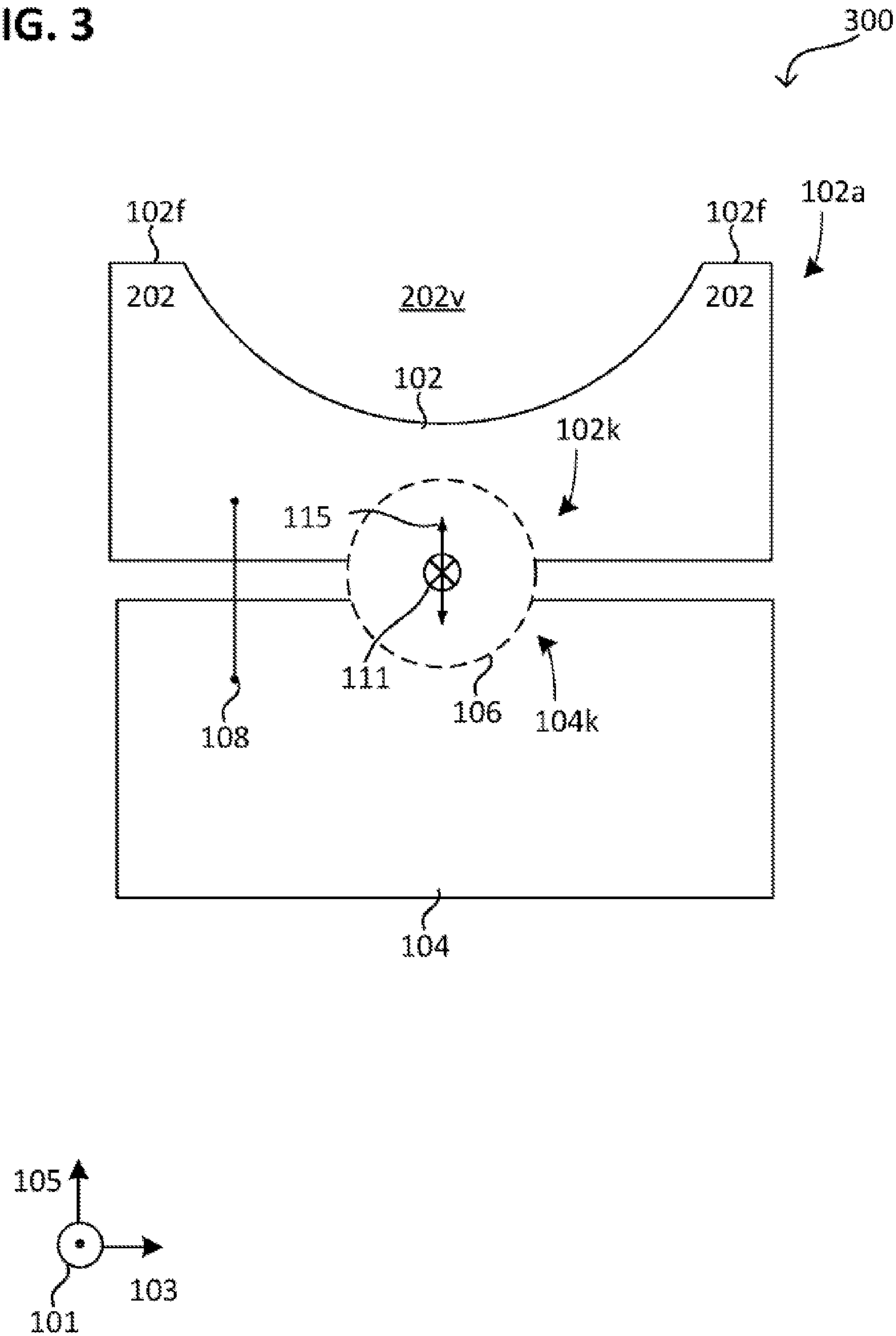

300
102f
102f
102a
202
202v
202
102
102k
115
111
106
104k
108
104
105
103
101

FIG. 4

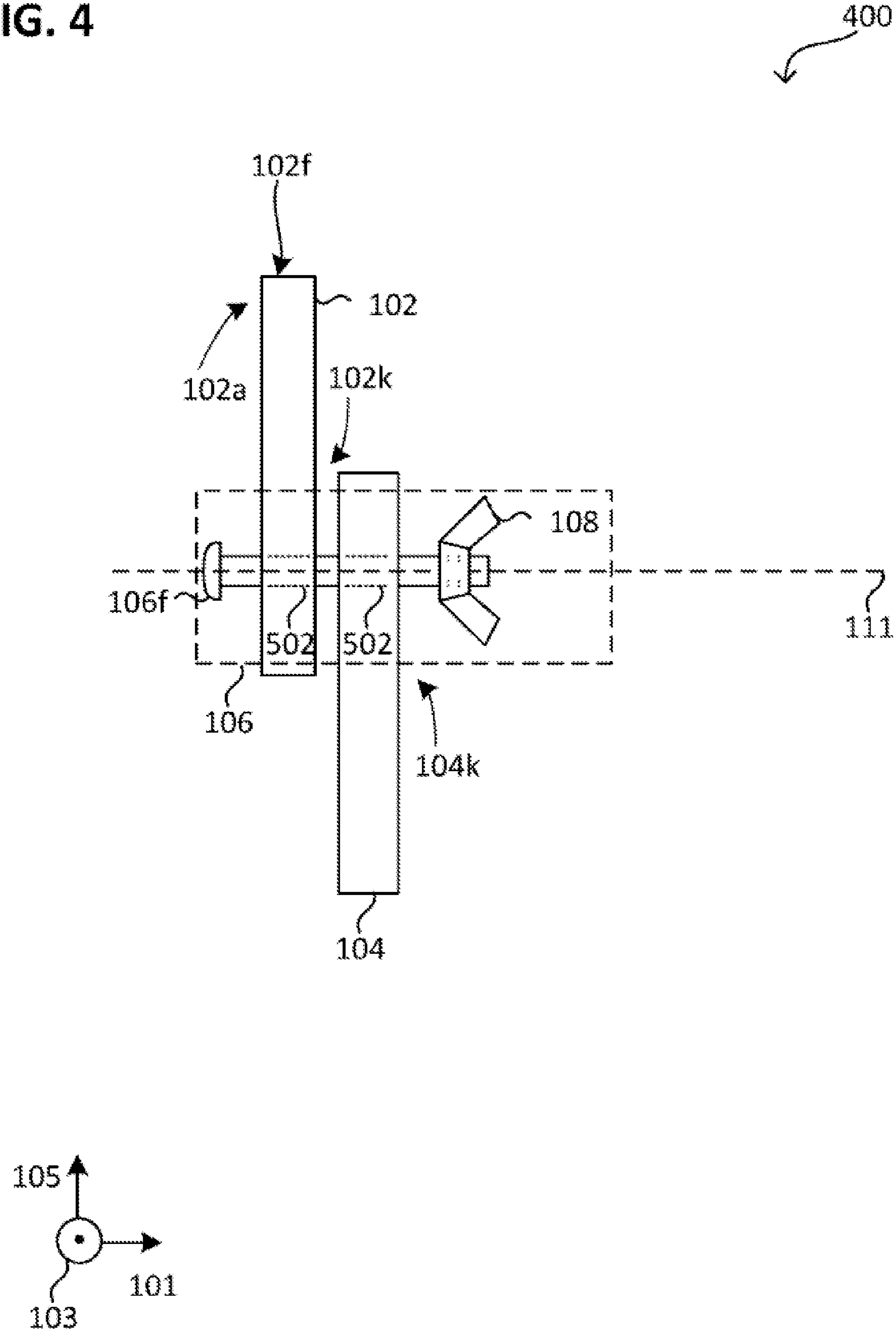

400
102f
102
102a
102k
108
106f
502
502
111
106
104k
104
105
101
103

FIG. 5

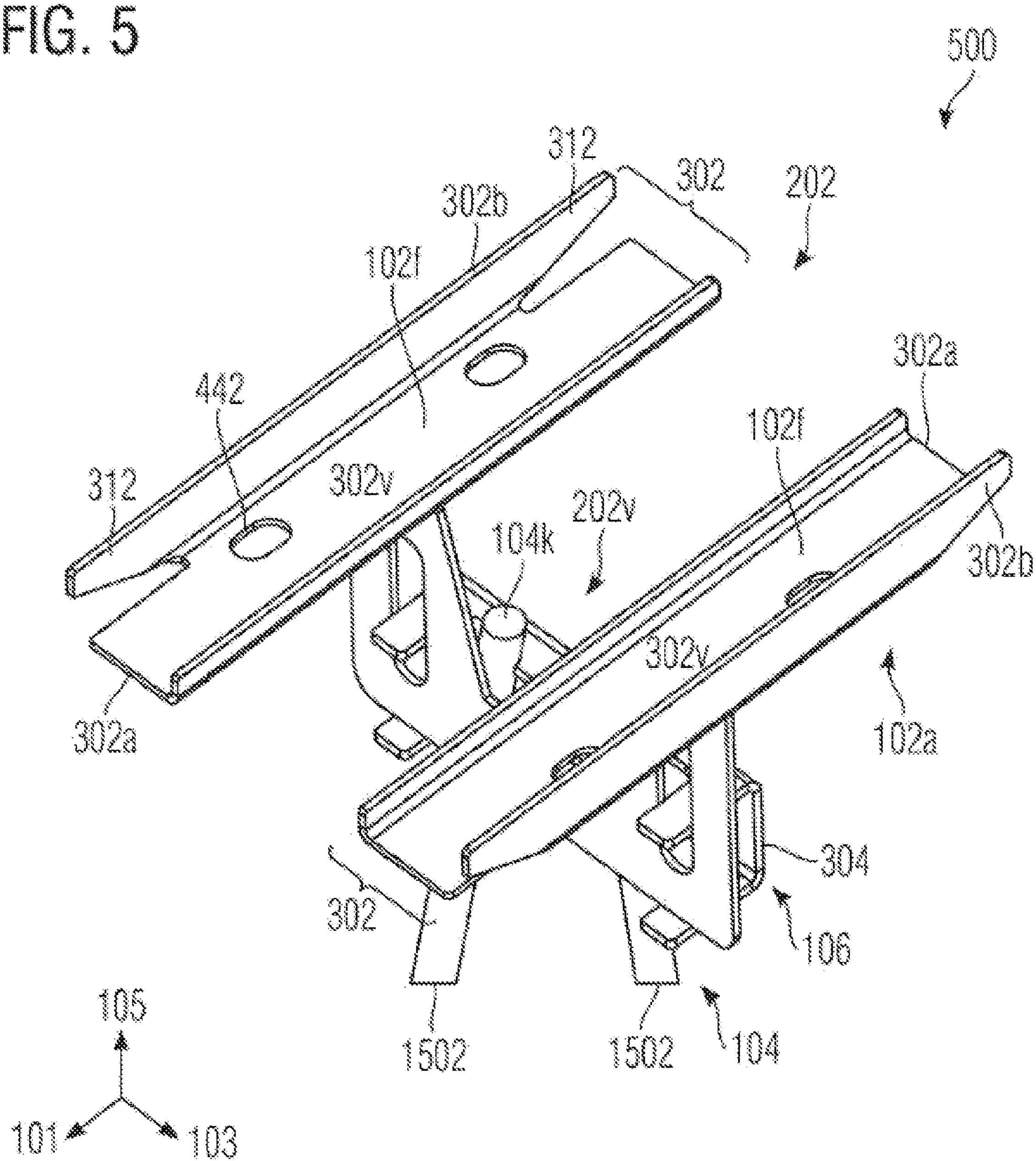

500
312
302
202
302b
102f
442
302a
102f
312
302v
202v
104k
302b
302v
302a
102a
304
302
106
105
1502
1502
104
101
103

FIG. 6

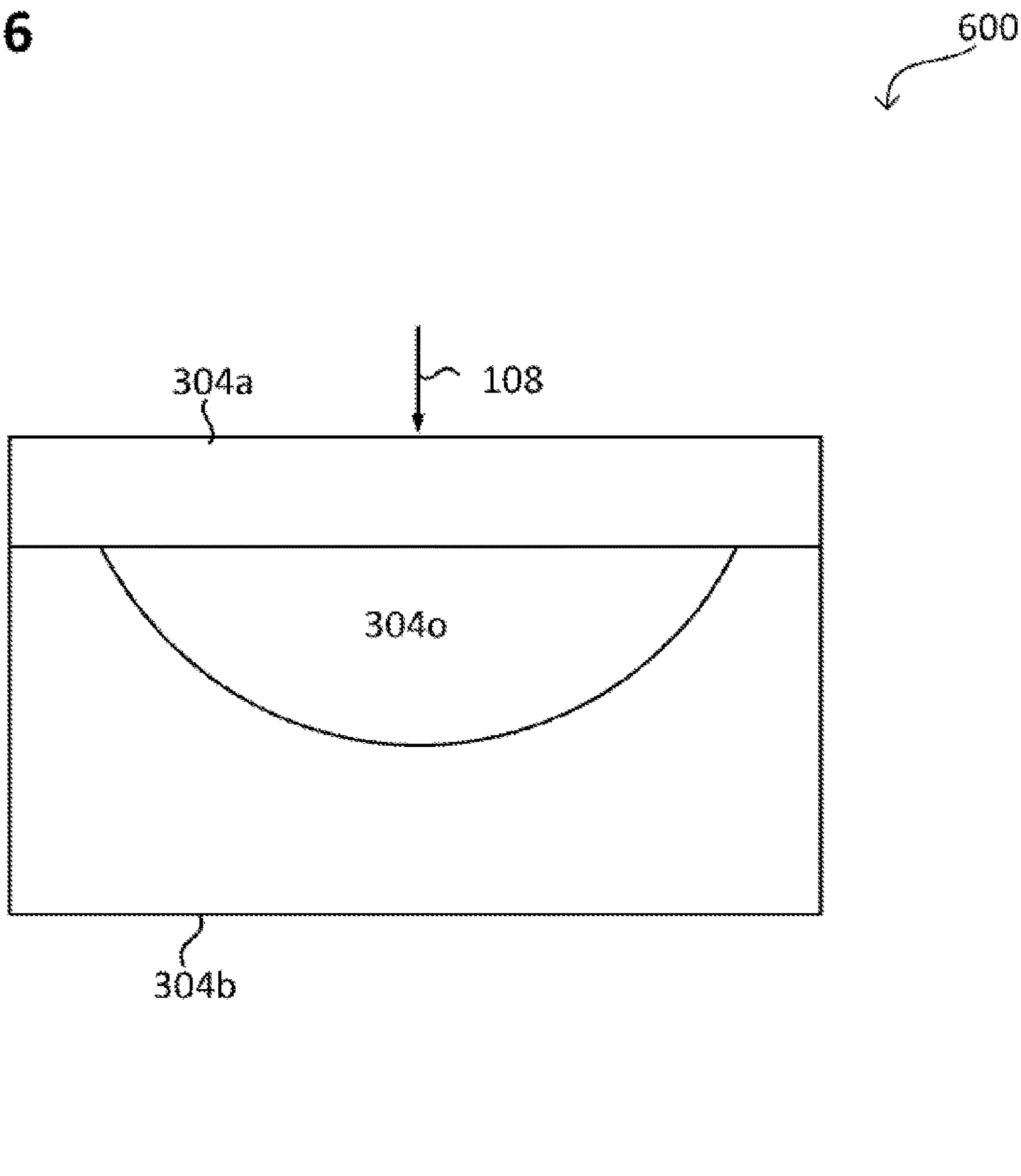


FIG. 7

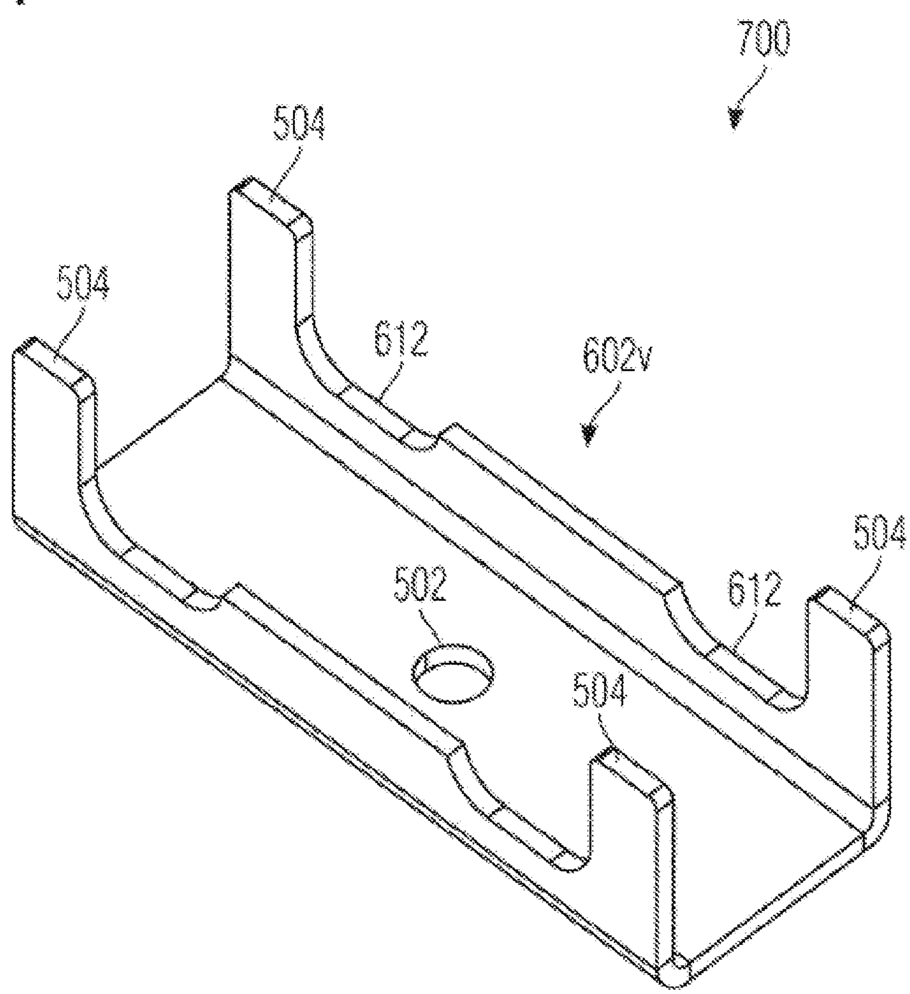


FIG. 8

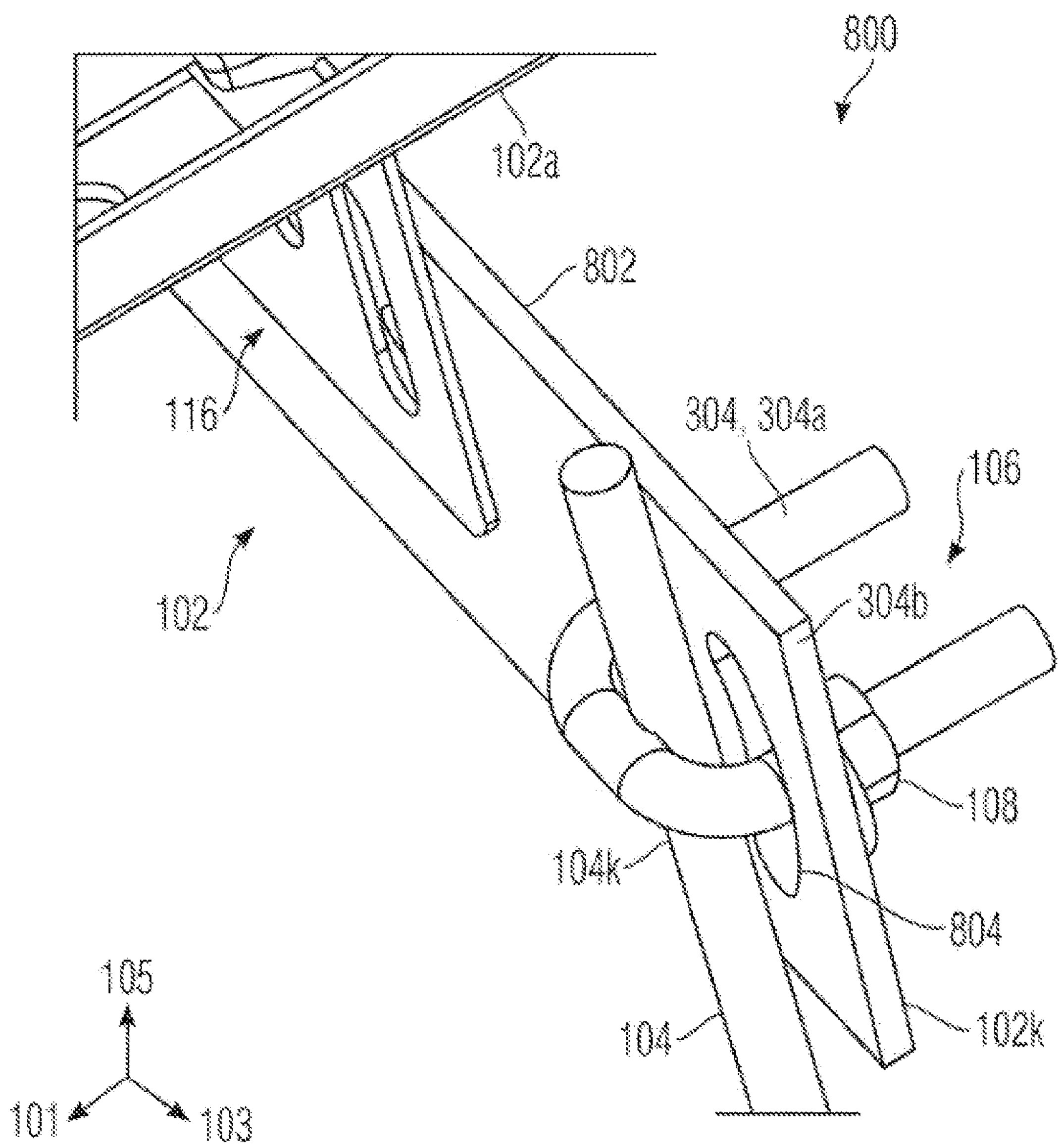

800
102a
802
116
304, 304a
106
102
304b
108
104k
804
105
104
102k
101
103

FIG. 9

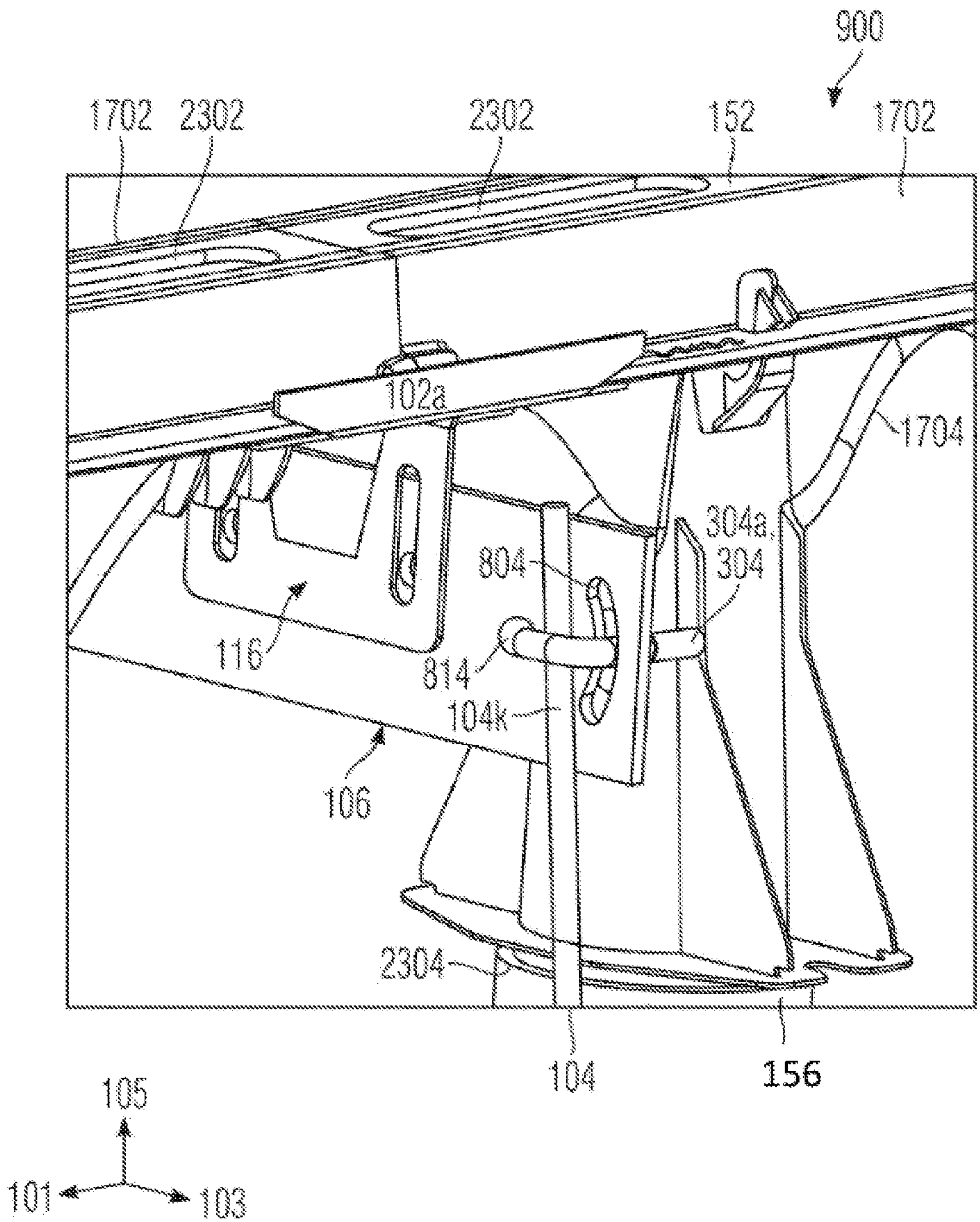

900
1702
2302
2302
152
1702
102a
1704
304a,
304
804
814
116
104k
106
2304
104
156
105
101
103

FIG. 10

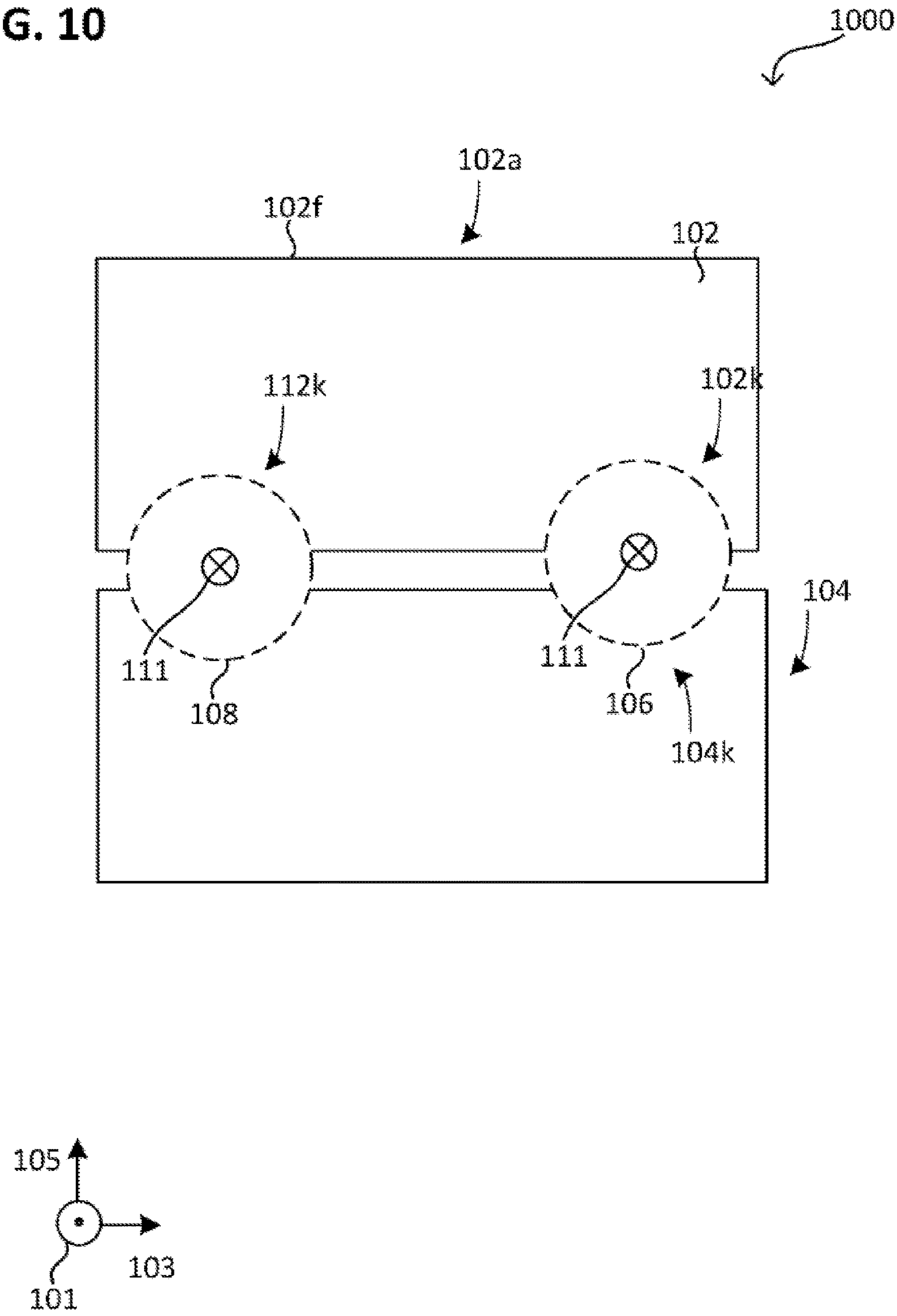

1000
102a
102f
102
112k
102k
104
111
111
108
106
104k
105
103
101

FIG. 11

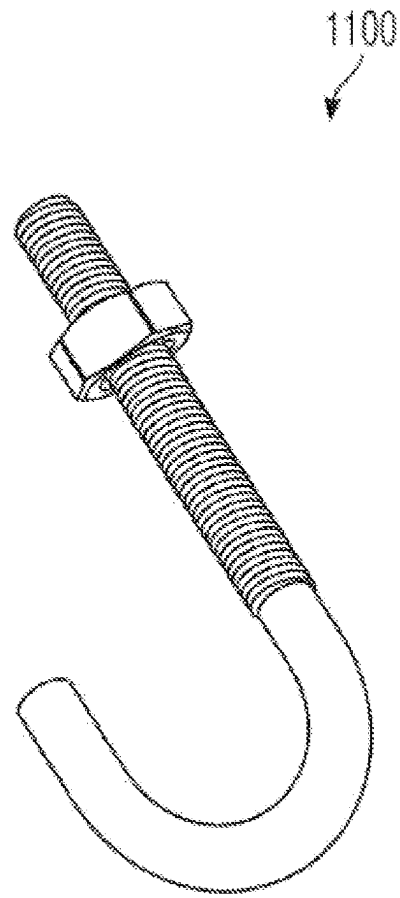


FIG. 12

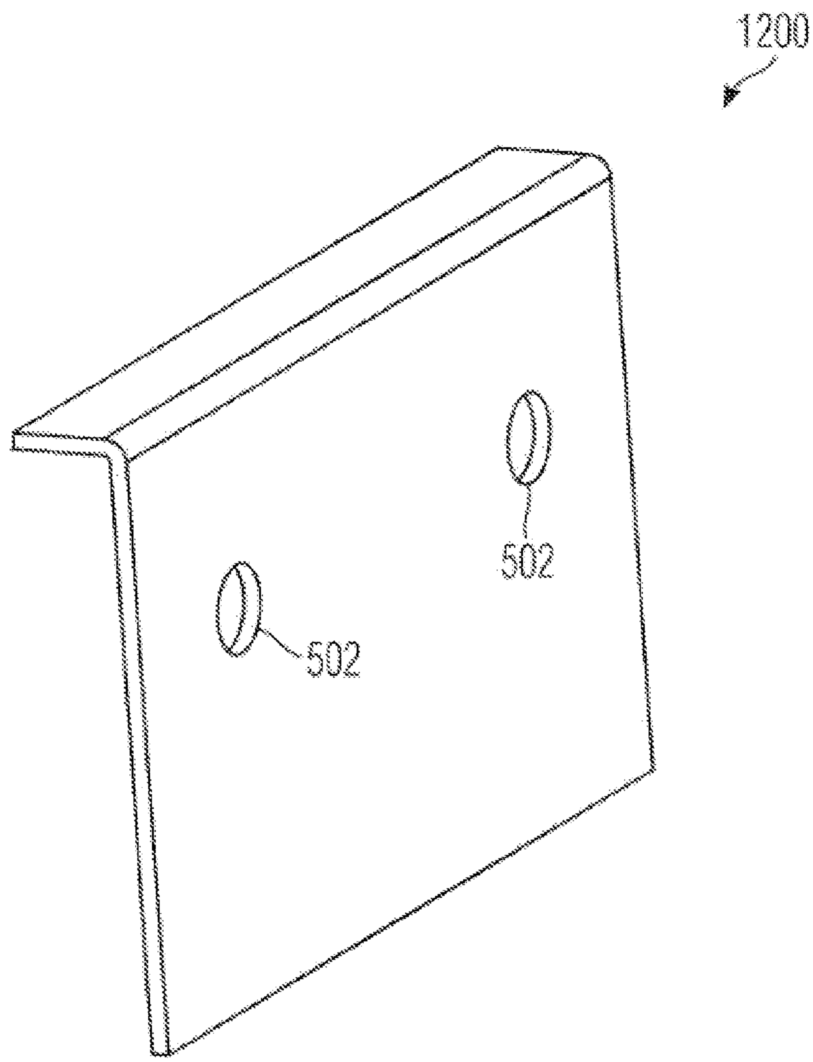


FIG. 13

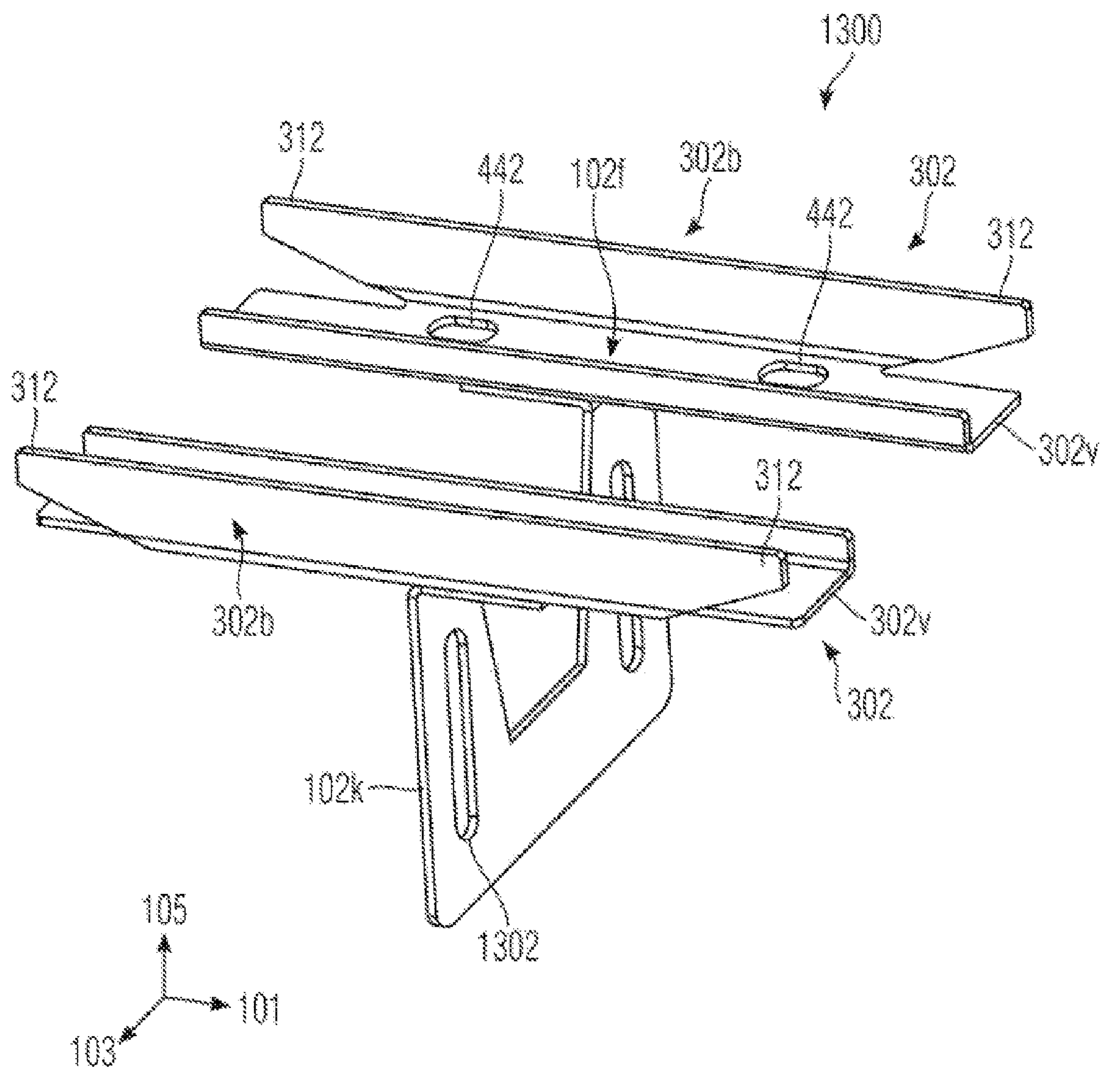

1300
312
442
102f
302b
302
442
312
312
302v
312
312
302b
302v
302
102k
1302
105
101
103

FIG. 14

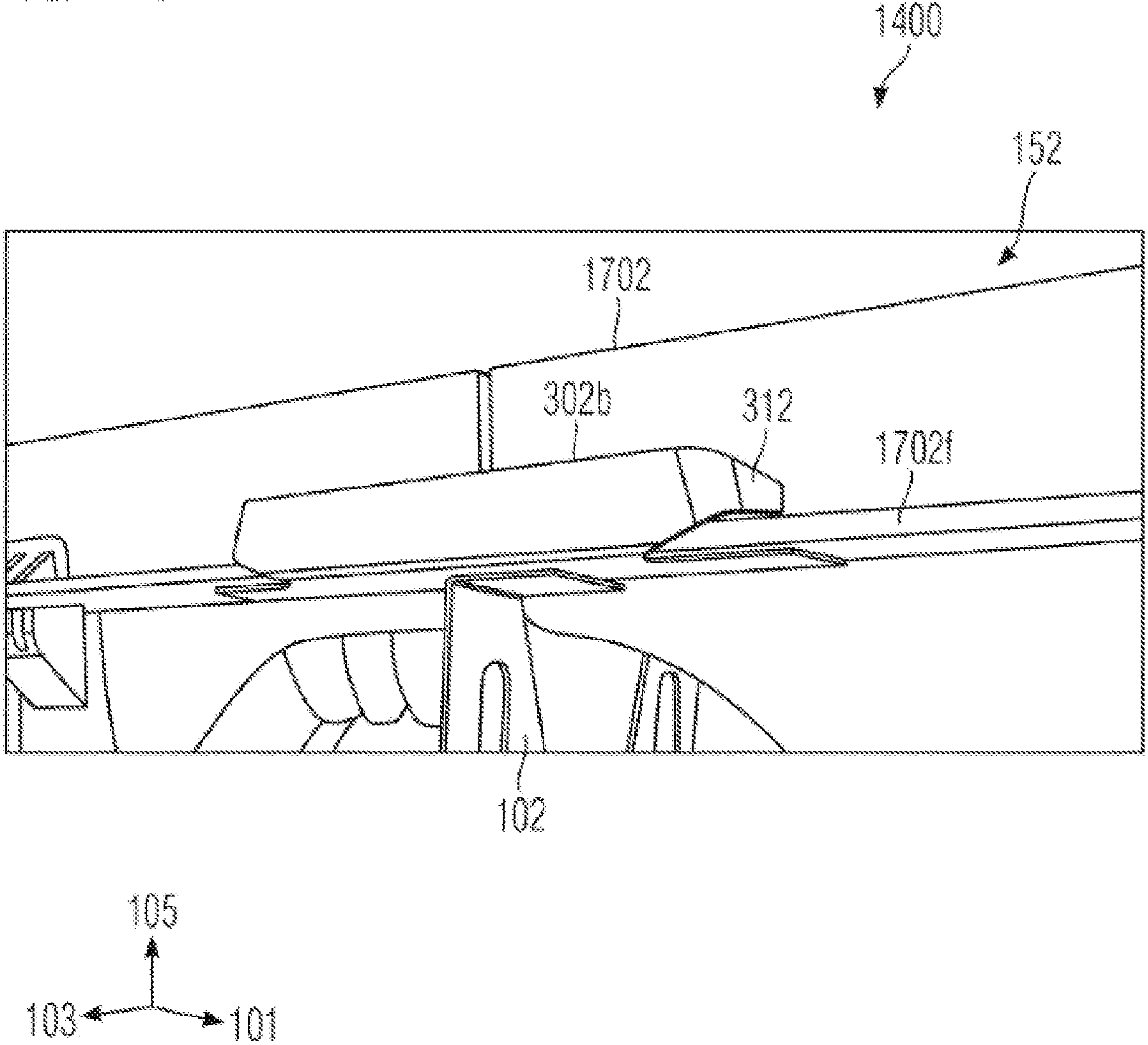


FIG. 15

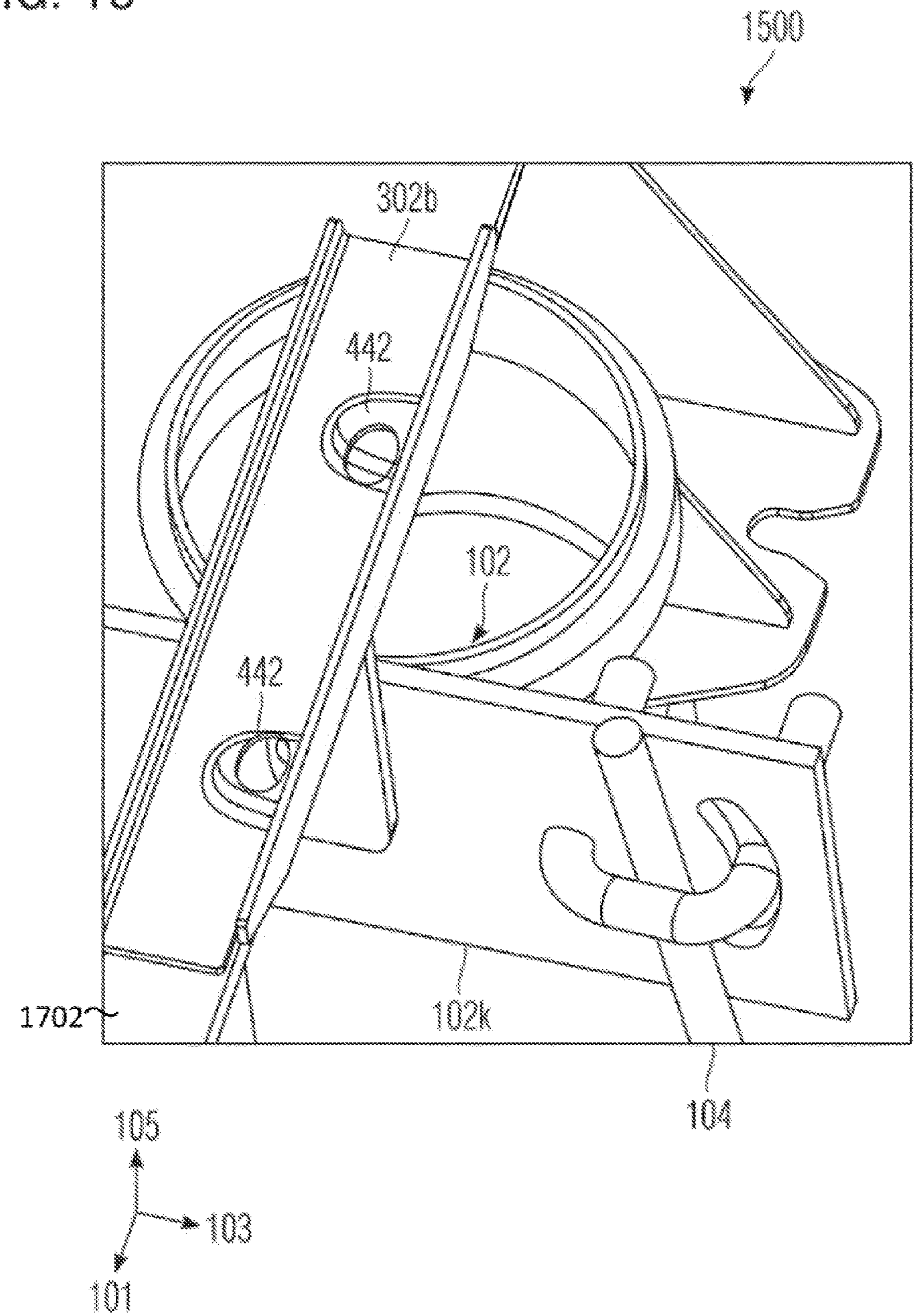


FIG. 16

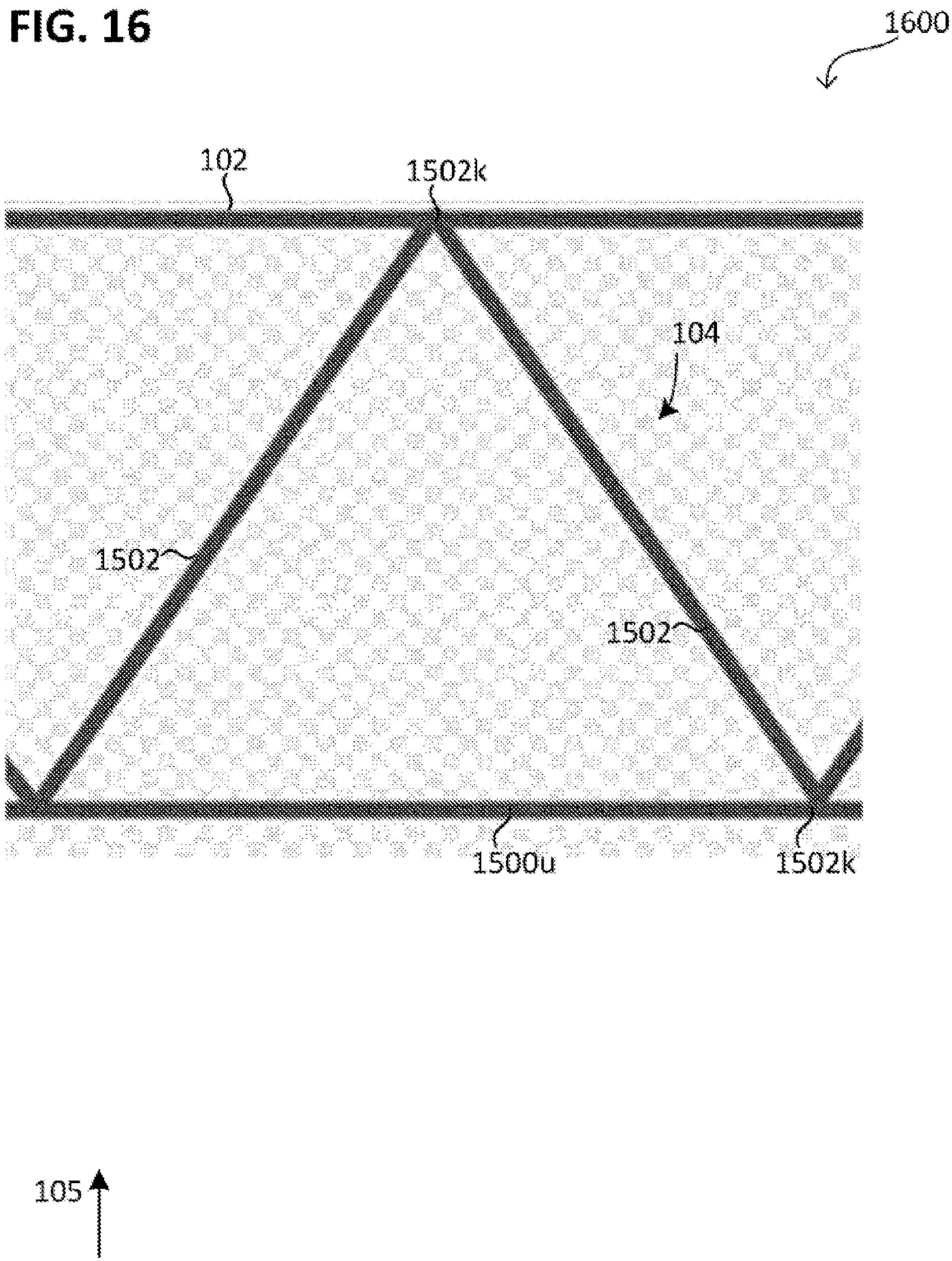


FIG. 17

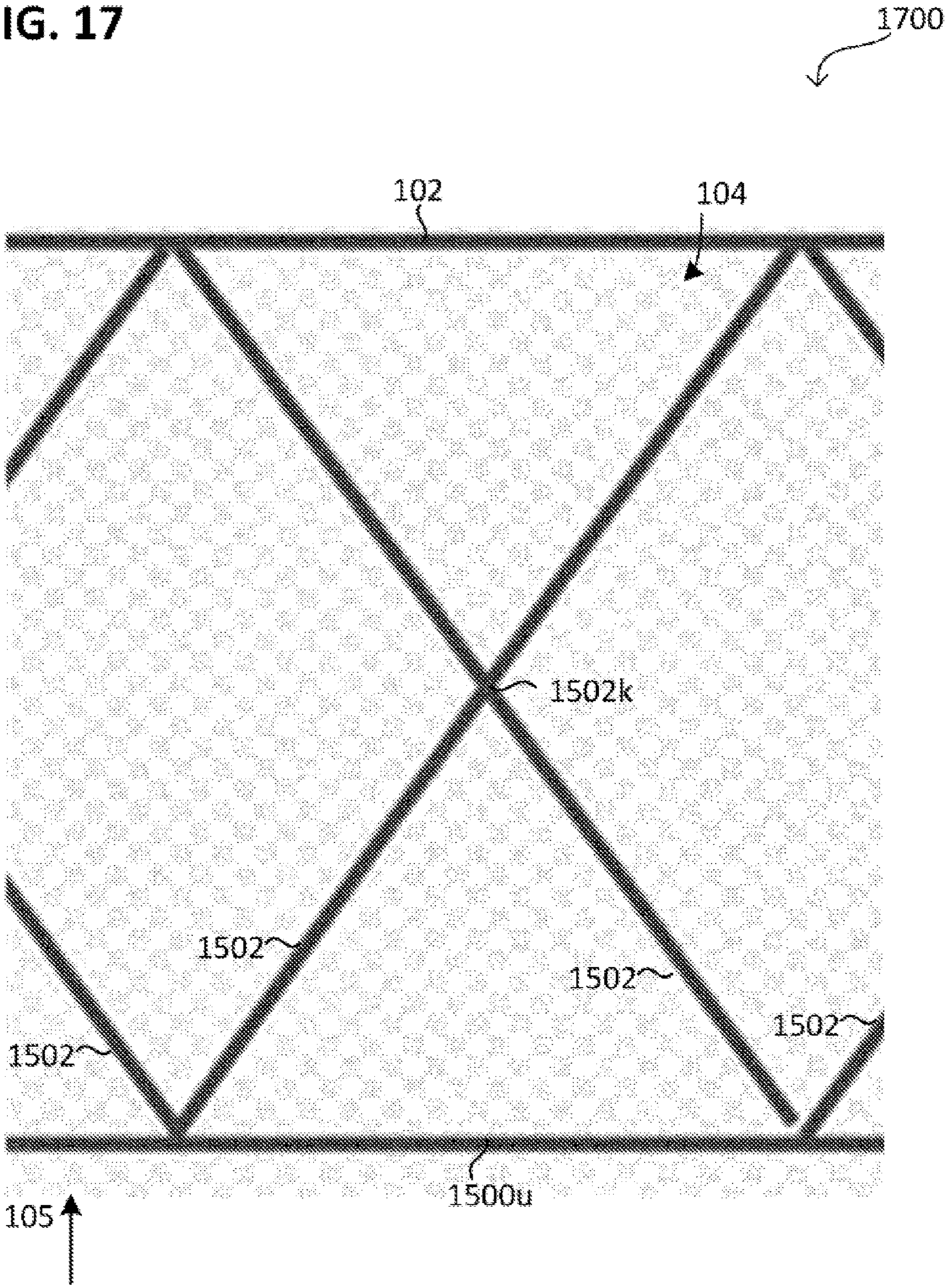


FIG. 18

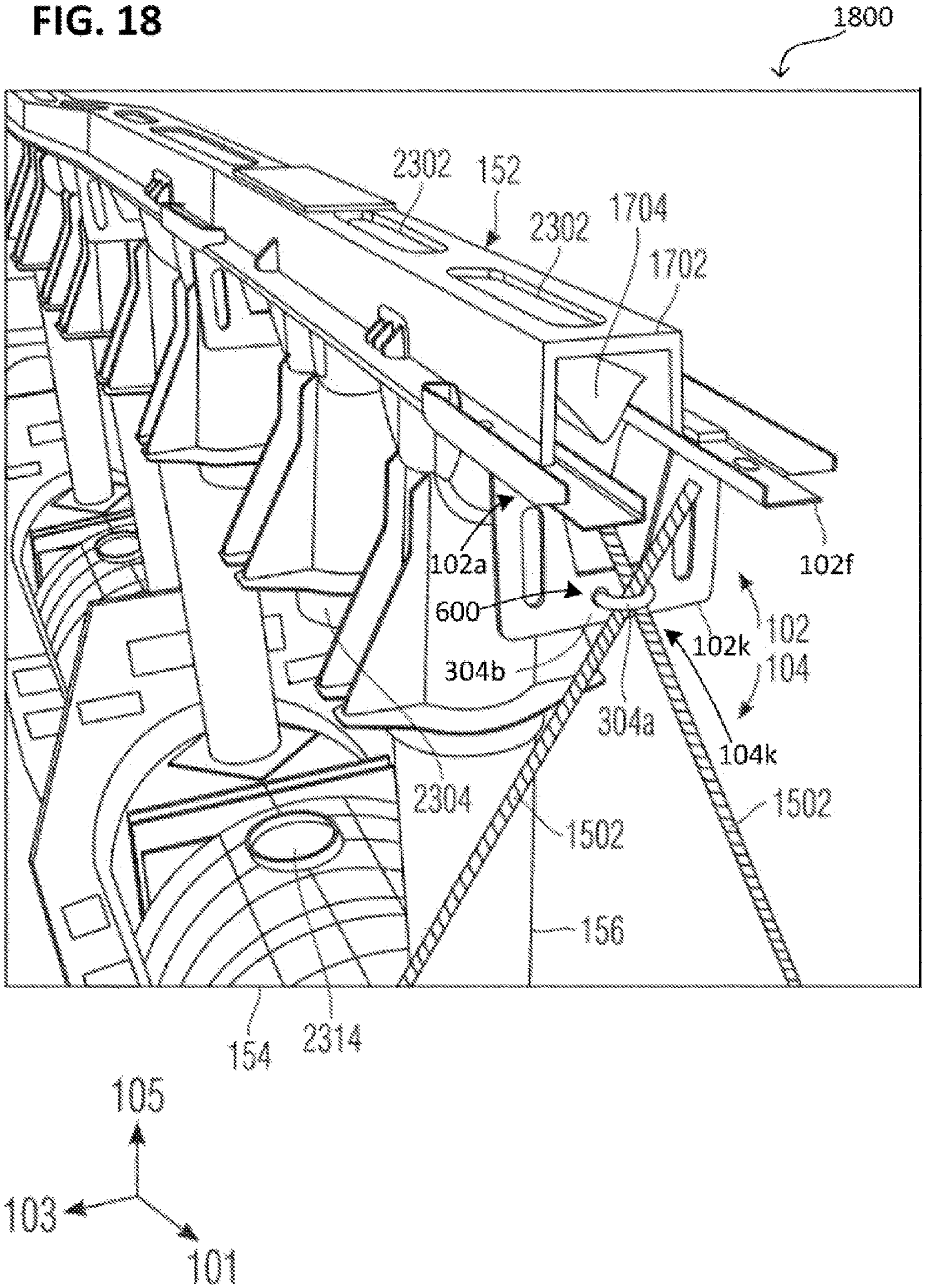

1800
2302
152
2302
1704
1702
102a
102f
600
102
102k
104
304b
304a
104k
2304
1502
1502
156
154
2314
105
103
101

FIG. 19

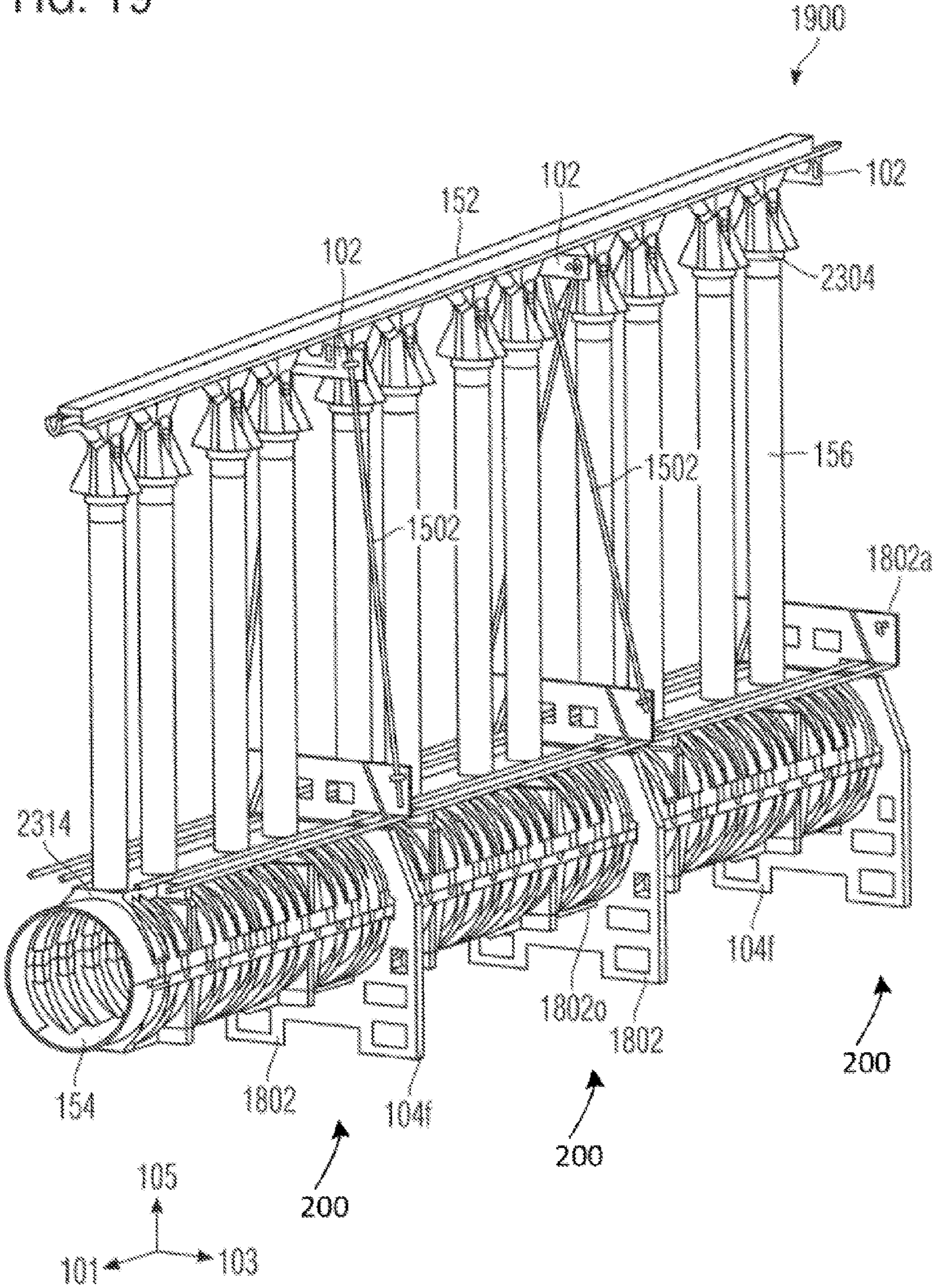
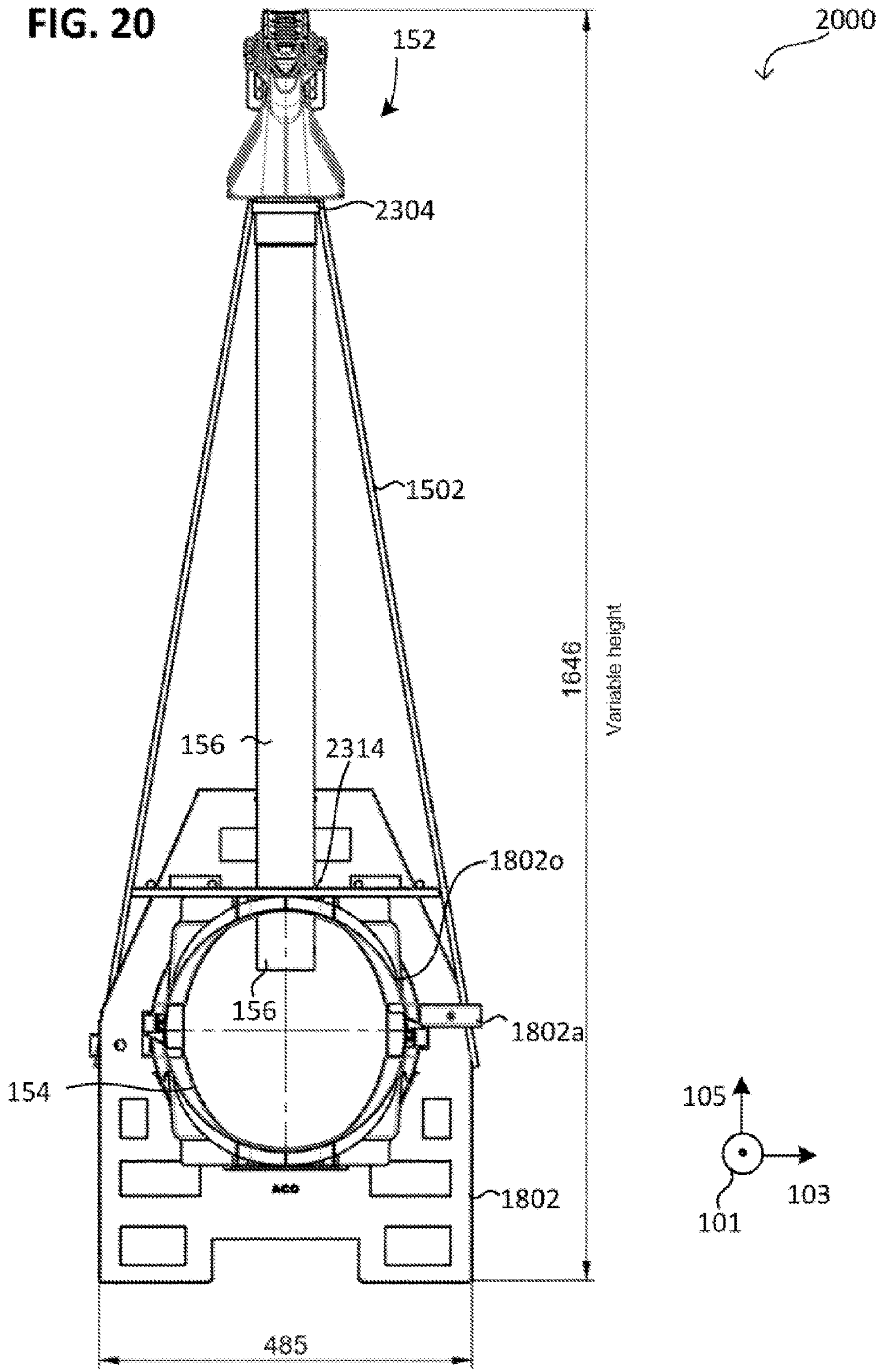

1900
102
102
152
102
2304
156
1502
1502
1802a
2314
104f
154
1802
104f
1802a
1802
200
200
200
105
101
103

FIG. 20



2000
152
2304
1502
1646
Variable height
156
2314
1802o
156
1802a
154
1802
485
105
103
101

FIG. 21

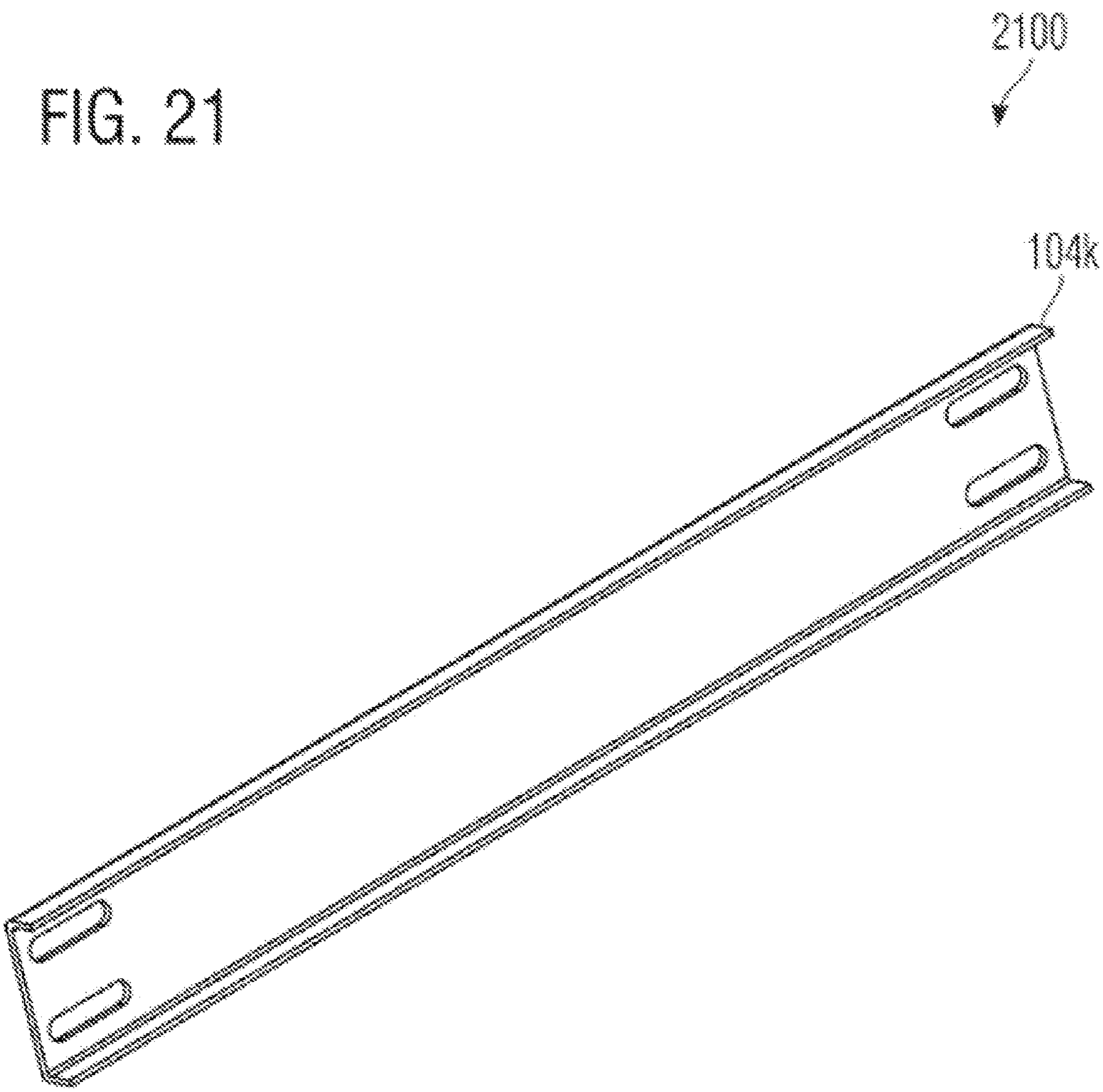
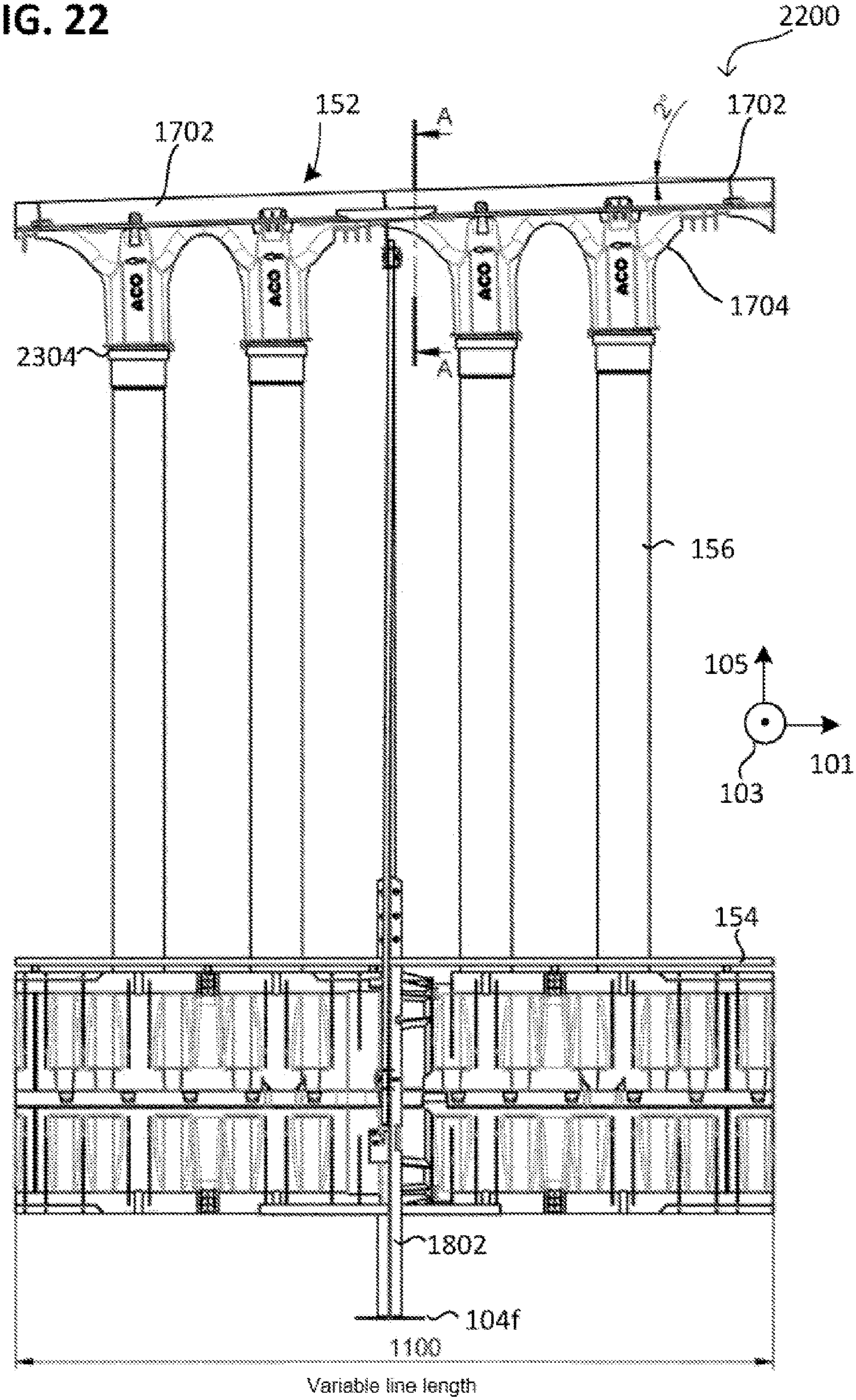


FIG. 22


2200
152
1702
1702
A
A
1704
2304
ACO
ACO
ACO
ACO
156
105
103
101
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1802
104f
1100
Variable line length

FIG. 23

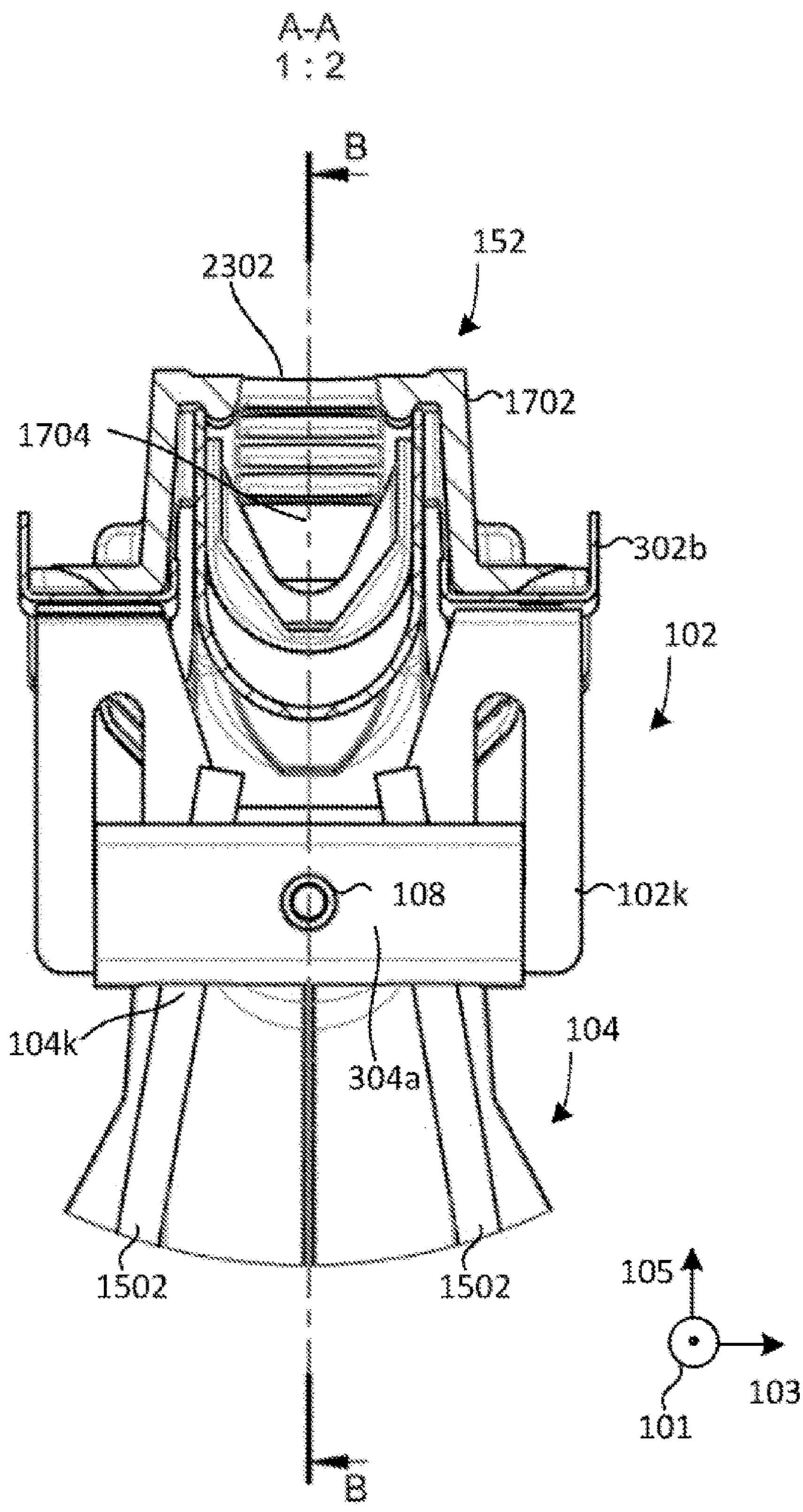

A-A
1 : 2
B
152
2302
1702
1704
302b
102
108
102k
104k
104
304a
1502
1502
105
103
101
B

FIG. 24

B-B
1 : 2

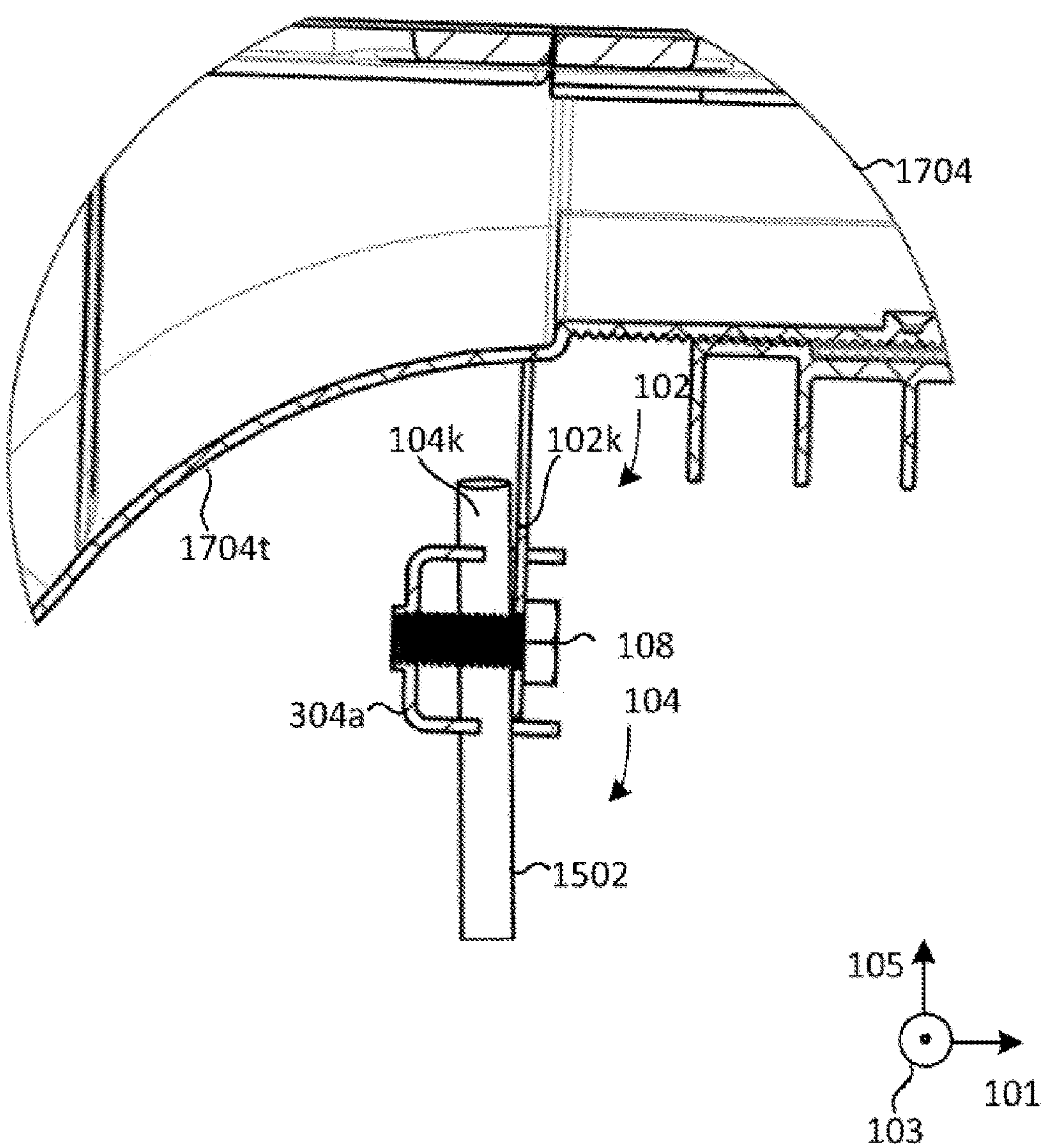
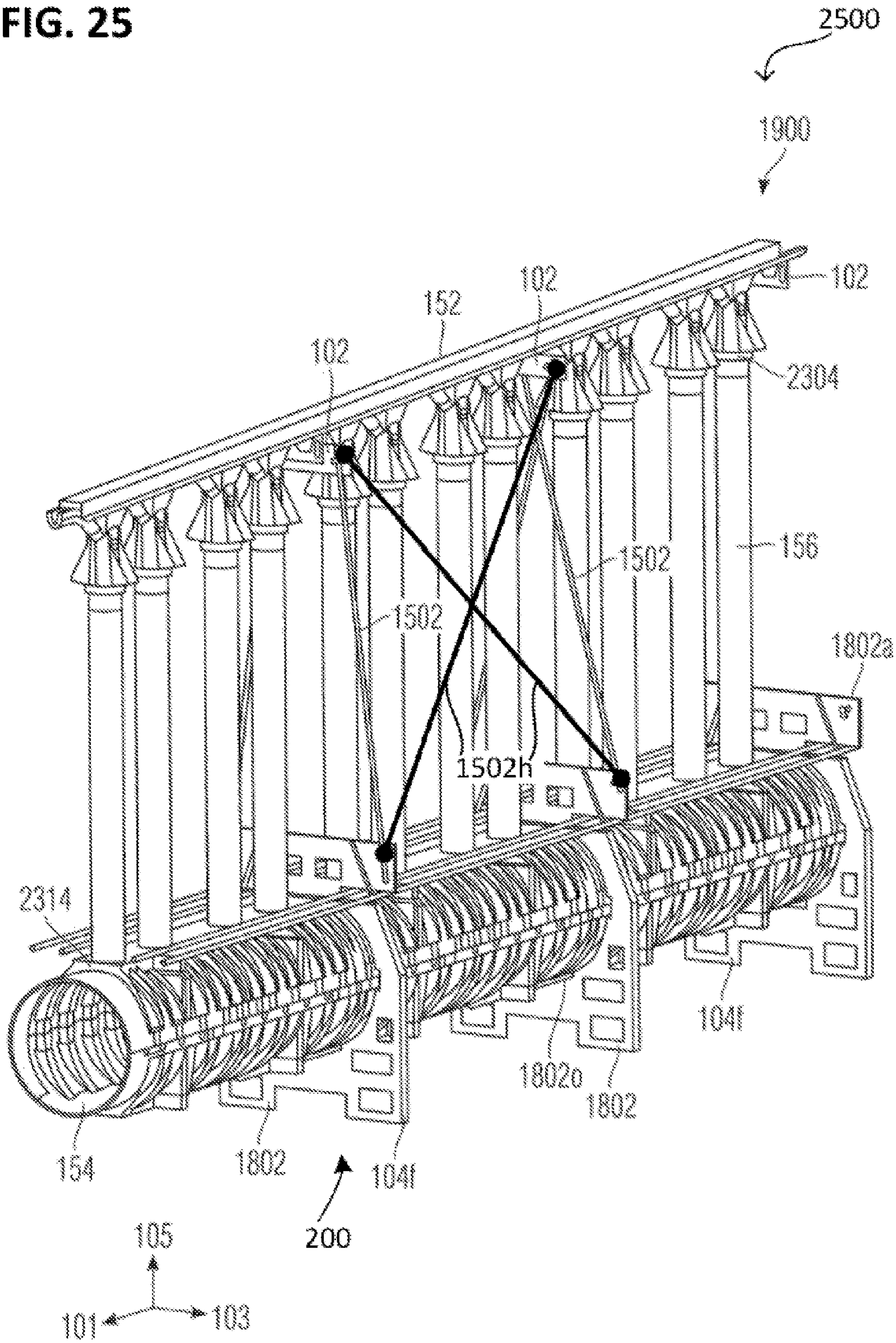


FIG. 25


2500
1900
102
152
102
102
2304
156
1502
1502
1802a
1502h
2314
104f
1802o
1802
154
1802
104f
200
105
101
103

CHANNEL-RETAINING DEVICE, DRAINAGE SYSTEM AND METHOD

Various exemplary embodiments relate to a channel-retaining device, a drainage system, and a method.

Drainage systems are conventionally used for drainage, e.g. for surface drainage. Although one-piece drainage channels can be laid quickly and with little effort, they are limited in the application scenarios that they serve, since they require particularly good terrain conditions and structurally weaken the subsoil. Therefore, a vertical functional separation is increasingly being used, so that the components close to the surface for water absorption are separate from the components for water transport, which require more installation space. On the one hand, this functional separation reduces the structural weakening of the subsoil and, on the other hand, facilitates the leveling of the terrain.

However, this also involves a larger number of components, which complicates the specific configuration of the surface drainage. Therefore, temporary frames are conventionally produced to hold the drainage system to be buried in position while it is being buried.

According to various embodiments, it was clearly recognized that these temporary frames are very time-consuming to produce; furthermore, they also require special (clearly well-versed and experienced) specialists and are limited in their accuracy and ability to align and can hardly be corrected afterwards. In particular, it is complex to achieve precise alignment of the components close to the surface in the three main axes. For example, suitable specialists are not always available, so that compromises have to be accepted in the precision and thus the performance of the drainage system.

According to various embodiments, a channel-retaining device, a drainage system, and a method are provided which make it possible to dispense with temporary frames or at least to require fewer temporary frames. According to various embodiments, the channel-retaining device provides a cost-effective and less complex mechanism for leveling the terrain, which clearly enables the most precise possible alignment (a height and/or position alignment) with little effort and also improves the overall quality of the drainage system. For example, the channel-retaining device makes it easier to compensate for uneven ground, to drain against the incline of the terrain, to form a sloping channel, and/or to bury the collecting pipe so deep that it experiences as little removal load as possible. The components close to the surface can clearly be aligned with the desired course of the surface to be drained, while the components for water removal are aligned in an optimal gradient, which does not necessarily have to extend parallel to the surface to be drained.

In the drawings,

FIG. **1** shows a drainage system according to various embodiments in a schematic side view or cross-sectional view;

FIGS. **2** to **5**, FIG. **8**, and FIG. **10** each show a channel-retaining device according to various embodiments in different schematic views;

FIG. **6** shows a clamping device according to various embodiments in a schematic side view or cross-sectional view;

FIG. **7** shows a clamp according to various embodiments in a schematic perspective view;

FIG. **9**, FIG. **14**, and FIG. **15** each show a drainage system according to various embodiments in various schematic views;

FIG. **11** shows a hook bolt according to various embodiments in a schematic perspective view;

FIG. **12** shows a clamping plate according to various embodiments in a schematic perspective view;

FIG. **13** shows a retaining holder according to various embodiments in a schematic perspective view;

FIG. **16** and FIG. **17** each show a channel-retaining device according to various embodiments in a schematic side view or cross-sectional view;

FIG. **18** to FIG. **20** and FIG. **25** each show a drainage system according to various embodiments in a schematic perspective view;

FIG. **21** shows a spacer plate according to various embodiments in a schematic perspective view; and

FIG. **22** to FIG. **24** each show an assembly of the drainage system according to various embodiments in various schematic views.

In the following detailed description, reference is made to the accompanying drawings that form a part thereof and in which specific embodiments are shown for illustration in which the invention may be practiced. In this regard, directional terminology such as "top," "bottom," "front," "back," "front," "rear," etc. is used with reference to the orientation of the figure(s) being described. Because components of embodiments can be positioned in a number of different orientations, the directional terminology is used for purposes of illustration and is in no way limiting. It is understood that other embodiments may be utilized and structural or logical changes may be made without departing from the protective scope of the present invention. It is understood that the features of the various exemplary embodiments described herein can be combined with one another unless specifically stated otherwise. The following detailed description is, therefore, not to be taken in a limiting sense, and the protective scope of the present invention is defined by the appended claims.

Throughout this description, the terms "connected," "attached," and "coupled" are used to describe both a direct and an indirect connection, a direct or indirect attachment, and a direct or indirect coupling. In the figures, identical or similar elements are provided with identical reference symbols, insofar as this is appropriate. According to various embodiments, the term "coupled" or "coupling" can be understood in the sense of a (e.g. mechanical and/or hydrostatic), e.g. direct or indirect, connection and/or interaction. For example, several elements can be coupled to one another along an interaction chain, along which the e.g. mechanical and/or hydrostatic interaction can be exchanged, e.g. a fluid (then also referred to as coupled in a fluid-conducting manner) or a force. According to various embodiments, "coupled" can be understood in the sense of a mechanical (e.g. physical) coupling, e.g. by means of direct physical contact. A coupling can be configured to transmit a mechanical interaction (e.g. force, torque, etc.).

In the context of this description, the expression "at least one" is used in connection with an element (e.g. an object, a process, a body) to describe a quantity of the element, which can be exactly one or more than one. Accordingly, the at least one element can be understood as comprising one or more than one element, e.g. comprising several (e.g. two or more, three or more, etc.) elements.

Within the scope of this description, the term "degree of freedom" is used in connection with a body or a system to describe a possibility of movement of the body or the system. Several degrees of freedom can designate possibilities of movement that are independent of one another, i.e. they correspond to axes that are perpendicular to one another. Basically, a degree of freedom can be either a translational degree of freedom or a rotational degree of freedom. Each degree of freedom can correspond to an axis to which the possibility of movement is related. For example, the translational degree of freedom may allow linear movement (i.e. translation) along the axis. For example, the rotational degree of freedom may allow rotational movement (i.e. rotation) about the axis. A fully free body has six degrees of freedom, namely three translational degrees of freedom and three rotational degrees of freedom. If a degree of freedom is blocked, there is no possibility of movement according to the corresponding axis. At least one degree of freedom can be blocked, for example, by creating a force fit, a form fit, or a material bond.

According to various embodiments, a joint provides a flexible coupling between two rigid bodies, i.e. a coupling that leaves at least one degree of freedom open. The respective mobility of a joint can be provided by means of at least one degree of freedom of the form of movement taking place therein, e.g. rotating in the case of a pivot joint and/or translation in the case of a sliding joint. The joint provides that the two bodies remain coupled to each other when moving relative to each other, i.e. they do not disengage from each other. The joint-forming regions (e.g. bore and bolt) of the two bodies that are geometrically designed to match one another are referred to as coupling regions. The joint-forming regions can be coupled to one another, for example, in that they form a form fit. The relative movement between the two bodies can, for example, take place in a sliding and/or rolling manner. The joint can be configured to transmit forces and/or torques acting at least along at least one axis between the two connected bodies.

In the context of this description, the term “drainage” is used in connection with “water” or “drainage.” It can be understood that this description can apply by analogy to other liquids that are not necessarily water or need to include water. For example, the drainage system described herein can be generally suitable for draining fluids of various types and compositions, e.g. liquids, flowable mixtures, or the like.

The channel-retaining device described herein can clearly be used as a support for a drainage channel. Various channel-retaining implementations are discussed herein, of which one has a simplified implementation that the channel-retaining device has support pillars supported on the ground or formwork, and of which one has a more complex implementation that the channel-retaining device has at least one pipe-retaining device supporting the bottom collecting pipe and the support pillars. The simplified implementation can be implemented especially cost-effectively. The more complex implementation, on the other hand, achieves greater precision.

According to various embodiments, the channel-retaining device has a retaining socket that is configured to be inserted into subsoil, mounted upright on the subsoil, or attached to formwork. Exemplary components of the retaining socket have: one or more struts, such as one or more rebars (also referred to as reinforcing bars), one or more shaped profiles, one or more tension and/or compression bars, one or more sheets, such as one or more spacer plates, one or more channel-retaining plates. For example, the drainage system can be arranged and installed in an excavation pit that has already been boarded up. In this case, the retaining socket (e.g. its struts) can be attached directly to the formwork, which facilitates assembly. If necessary, the struts can be bent and/or shortened to the desired position.

According to various embodiments, the channel-retaining device has at least one retaining holder, which has at least one coupling region (also referred to as the first coupling region) for coupling the retaining socket. Exemplary components of the retaining holder have: at least one recess, at least one sheet, at least one rail, at least one holder, and at least one joining device for the drainage channel.

According to various embodiments, at least one of the following is provided by means of the channel-retaining device: that a stepless alignment and/or height adjustment of an inlet molding device takes place, which is supported, for example, by means of reinforcing bars; that the channel-retaining device provides a joint for laterally tilting the inlet molding device; that the channel-retaining device can be retrofitted to the inlet molding device; that a truss is provided by means of the supporting struts; and that spacer plates can be used as an alternative to the struts (e.g. reinforcing bars).

FIG. **1** shows a drainage system **100** according to various embodiments in a schematic side view or cross-sectional view; According to various embodiments, the drainage system **100** can have a drainage inlet device **152** (also referred to simply as an inlet device or inlet molding device), optionally have a collecting line **154** (also referred to as a water removal line or collecting fluid line), and optionally have at least one drop line **156**. The or each collecting line **154** can be or can be provided, for example, by means of at least one collecting pipe **154** (also referred to as a water removal pipe). The or each drop line **156** can be provided, for example, by means of at least one downpipe **156**.

In principle, however, the drainage system **100** does not necessarily have to have the at least one collecting pipe **154** or downpipe **156** as a separate component (e.g. plastic pipe, concrete pipe, wooden pipe, sheet metal pipe) in order to provide the corresponding lines. For example, the embedding material can have cavities formed in some other way (e.g. natural or artificial), which provide at least one collecting line **154** and/or at least one drop line **156** or to which the liquid taken up by the drainage inlet device **152** can be fed. To put it more clearly, the collecting line **154** or drop line **156** can also be provided as a monolithic component of the embedding material. In order to form such fluid-conducting cavities in the embedding material, a displacement body (e.g. polystyrene) can be introduced into the embedding material, for example, which is removed (e.g. thermally decomposed) when the embedding material has hardened. Instead of the displacement body, the cavity of the downpipe **156** or the collecting pipe **154** then remains.

In the following, for ease of understanding, reference is made to the collecting pipe **154** and downpipe **156** as exemplary lines. What has been described for the collecting pipe **154** can also apply analogously to any collecting line **154** provided differently, or what has been described for the downpipe **156** can also apply analogously to any drop line **156** provided differently.

The drainage system **100**, for example its drainage inlet device **152** and/or its collecting pipe **154**, can be longitudinally extended along direction **101** (for example, the direction of flow of the drainage channel or the collecting pipe). When the drainage system **100** is installed, planetary gravity can act on the drainage system **100** from direction **105**.

For example, direction **105** can then be essentially parallel to the vertical (i.e. with a maximum deviation of 10°). When the drainage system **100** is assembled, each downpipe **156** can be longitudinally extended along direction **105**.

The collecting pipe **154** may have one or more than one pipe section. For example, the collecting pipe **154** can be in several parts. The multi-part collecting pipe **154** can have several pipe segments, which are arranged one behind the other along direction **101** and joined together so that they form a common cavity.

The drainage inlet device **152** can have at least one drainage channel or be formed therefrom. Optionally, the drainage inlet device **152** can be composed of several parts. The multi-part drainage inlet device **152** can have, for example, a multi-part drainage channel and/or an enclosure device (also referred to as a frame). The drainage channel can, for example, have a plastic or be formed therefrom, which reduces its production costs.

The frame can, for example, laterally enclose the (e.g. multi-part) drainage channel. The frame can have a groove, for example, in which the drainage channel is arranged. The frame can, for example, have or be formed from a metal (e.g. steel), which increases stability. For example, the frame can be a cast product (then also referred to as a cast frame).

Furthermore, the drainage inlet device **152** (e.g. its frame) can have several openings **2302** (also referred to as inlet openings) arranged one behind the other along direction **101**, of which each opening optionally extends longitudinally along direction **101** (then also referred to as a longitudinal slot). This improves the water absorption rate.

The multi-part drainage channel can have several channel segments, which are arranged one behind the other along direction **101** and are joined together, for example, by means of the frame. Optionally, each channel section can be funnel-shaped.

Each downpipe **156** may be positioned between the drainage inlet device **152** and the collecting pipe **154**. Each downpipe **156** may fluidly couple the drainage inlet device **152** (e.g. its drainage channel) to the collecting pipe **154**. For this purpose, the drainage inlet device **152**, e.g. its drainage channel (e.g. each channel section), can have an opening **2304** (also referred to as an upper drop opening **2304**) which is coupled to a downpipe **156**. By analogy, the collecting pipe (e.g. each pipe section) may have an opening **2314** (also referred to as a lower drop opening **2314**) which is coupled to a downpipe **156** or through which the downpipe **156** protrudes into the collecting pipe **154**.

Optionally, the collecting pipe **154** may include a seal (e.g. an O-ring) surrounding the drop opening of the collecting pipe **154**. This means that the downpipe **156** can be inserted into the drop opening of the collecting pipe **154** so that the height of the latter can be adjusted. Optionally, the collecting pipe **154** can have one hold-down device (e.g. a seal hold-down plate), which surrounds the downpipe **156**, per drop opening. The drop opening can be covered in direction **105** and/or the seal can be held in position by means of the hold-down device. The connection between the hold-down device and the collecting pipe **154** can be made, for example, by means of screws.

When the drainage system **100** is assembled, the drainage inlet device **152** may be exposed at the drainage surface **151**. This means that liquid on the surface **151** is taken up by the drainage inlet device **152**. The collected liquid is routed to the downpipes, which routes the liquid to the collecting pipe **154**, by means of the drainage inlet device **152**.

When the drainage system **100** is assembled, the collecting pipe **154** and the at least one downpipe **156** (if present) can be arranged below a surface **151** to be drained (also referred to as the drainage surface **151**). The drainage surface **151** may be, for example, the surface of a structurally sealed surface, such as an asphalt layer or a concrete layer. For example, the collecting pipe **154** and the at least one downpipe **156** can be arranged below the drainage surface **151**, e.g. embedded in a material (also referred to as embedding material). Examples of the embedding material include: earth, gravel, sand, concrete, or asphalt.

In order to facilitate the assembly of the drainage system **100**, the drainage channel can be retained, for example supported from below, by means of a channel-retaining device **200** according to various embodiments. The inlet openings **2302** can be arranged, for example, on a side of the drainage inlet device **152** that faces away from the channel-retaining device **200**.

A method of assembling the drainage system **100** may include aligning the drainage inlet device **152** (e.g. its drainage channel) being retained by the channel-retaining device **200**. During alignment, the channel-retaining device **200** may be in an unlocked state. In the unlocked state, the channel-retaining device **200** may provide the drainage inlet device **152** with one or more degrees of freedom (e.g. rotational degrees of freedom and/or translational degrees of freedom).

Once the alignment is complete, the channel-retaining device **200** can be placed in a locked state (also referred to as locking). For example, the locking may include reducing, e.g. to zero, the number of degrees of freedom provided to the drainage inlet device **152** by means of the channel-retaining device **200**. In the locked state, the at least one degree of freedom can be blocked.

The channel-retaining device **200** can be placed in the locked state or in the unlocked state by means of a locking device, as will be described later in more detail.

FIG. **2** shows a channel-retaining device **200** according to various embodiments in a schematic side view or cross-sectional view. The channel-retaining device **200** can have a retaining holder **102** and a retaining socket **104**. The retaining holder **102** can have a first coupling region **102*k***. The retaining socket **104** can have a second coupling region **104*k***.

The retaining holder **102** and/or the retaining socket **104** can, for example, have or be formed from a metal (e.g. steel), which increases stability.

The first coupling region **102*k*** and the second coupling region **104*k*** can be configured relative to one another in such a way that they are or can be joined together. The coupling between the first coupling region **102*k*** and the second coupling region **104*k*** can be formed by plugging, screwing, or clamping, for example. However, the first coupling region **102*k*** and the second coupling region **104*k*** do not necessarily have to be pre-assembled. For example, they can also be joined together when the drainage system is installed, for example shortly before a drainage channel is aligned.

The joining together can include the first coupling region **102*k*** and the second coupling region **104*k*** being coupled (or connected) to one another, for example by means of a form fit and/or by means of a connecting element. The cohesion between the first coupling region and the second coupling region is created or increased by means of the joining together. The coupling can be movable, so that the first coupling region **102*k*** and the second coupling region **104*k*** form a joint **106** when joined together. The operating forces that occur are transferred via the active surfaces of the connection, and at least one degree of freedom is provided.

The coupling between the first coupling region **102*k*** and the second coupling region **104*k*** can be detachable, non-detachable, or conditionally detachable. The non-detachable coupling can, for example, have a material bond, e.g. a welded connection. The non-detachable coupling is, for example, irreversible in such a way that it can only be released by destroying the first coupling region **102*k*** and/or the second coupling region **104*k***. The detachable coupling can, for example, have a screw connection. The detachable coupling can, for example, be reversibly detached and established, for example, without any significant impairment to the components involved in the coupling. The conditionally detachable coupling can, for example, have a rivet connection or a soldered connection. The conditionally detachable coupling is, for example, irreversible in such a way that it can be released by destroying a coupling component (e.g. the rivets) but without destroying the first coupling region **102**k and/or the second coupling region **104**k.

The joint **106** can provide the retaining holder **102** and the retaining socket **104** with at least one (i.e. one or more than one) degree of freedom **111**, **115** relative to one another. The at least one degree of freedom **111**, **115** can have one or more than one rotational degrees of freedom (also referred to as a rotation degree of freedom) and/or one or more than one translational degrees of freedom (also referred to as a translation degree of freedom).

The at least one degree of freedom can have at least one rotational degree of freedom **111**, for example, which is along direction **101**. The rotational degree of freedom **111** provides that the retaining holder **102** and the retaining socket **104** can be rotated relative to one another about an axis of rotation, which is along the rotational degree of freedom **111**. This means that a drainage channel held by means of the channel-retaining device **200** can be tilted laterally so that its spatial position can be adjusted (also referred to as alignment).

The at least one degree of freedom can have at least one translational degree of freedom **115**, for example, which is along direction **105**. The translational degree of freedom **115** provides that the retaining holder **102** and the retaining socket **104** can be displaced towards or away from one another along a translational axis, which is along the translational degree of freedom **115**. This means that a drainage channel held by means of the channel-retaining device **200** can be displaced vertically so that its spatial position can be adjusted (also referred to as alignment).

The retaining holder **102** can also have a retaining region **102**a for supporting the drainage channel extending along direction **101**. The retaining region **102**a can, for example, be opposite the first coupling region **102**k.

In principle, the retaining region **102**a can be adapted to the shape of the drainage channel. For example, the retaining region **102**a can have a bearing surface which faces away from the first coupling region **102**k. The bearing surface can be curved, angled, or planar, for example, or have mixed forms of these.

For example, the retaining holder (and its retaining region **102**a) can be a component separate from the drainage channel, which component can optionally be or become connected to the drainage channel. As an alternative or in addition, the retaining holder (and its retaining region **102**a) can be connected to the drainage channel or a component (e.g. the frame) of the drainage channel by a material bond.

The channel-retaining device **200** can also have a locking device **108** which is configured to be placed in a first state or into a second state. When placed in the first state, the locking device **108** can block the at least one degree of freedom **111**, **115** so that the retaining holder **102** and the retaining socket **104** are locked together. The channel-retaining device **200** is then in the locked state.

When placed in the second state, the locking device **108** can release the at least one degree of freedom so that the retaining holder **102** and the retaining socket **104** are movable relative to each other. The channel-retaining device **200** is then in the unlocked state.

For example, the locking device **108** can be configured to lock the retaining holder **102** and the retaining socket **104** to one another by means of a form fit, a force fit, and/or a material bond. The force fit can be established, for example, by means of a thread on the locking device **108**. The form fit can be established, for example, by means of a bolt on the locking device **108**. The material bond can be established, for example, by means of welding the locking device **108**.

Exemplary components of the locking device **108** have: at least one rivet, at least one bolt, at least one screw, at least one nut, at least one lever, at least one thread, at least one locking lug.

Optionally, the retaining holder **102** and/or the retaining socket **104** can be in multiple parts, as will be described later in more detail.

Alignment of the drainage inlet device **152** (e.g. its drainage channel), which is held by means of the retaining holder **102** of the channel-retaining device **200**, can include moving the retaining holder **102** and the retaining socket **104** relative to one another according to the at least one degree of freedom **111**, **115** (e.g. rotational degree of freedom). In this way, their position (position and/or orientation) can be changed relative to one another. Once the alignment of the drainage inlet device **152** is complete, the channel-retaining device **200** can be locked. The locking can include transitioning the locking device **108** into the first state so that the retaining holder **102** and the retaining socket **104** are locked together. In the first state, the locking device **108** can be configured to be detachable, non-detachable, or conditionally detachable.

FIG. **3** shows a channel-retaining device **200** according to various embodiments **300** in a schematic side view or cross-sectional view, in which the retaining holder **102** is fork-shaped (then also referred to as a retaining fork).

The retaining fork **102**, e.g. its retaining region **102**a, can have two spatially separated sections **202** (also referred to as retaining sections **202**), of which each retaining section **202** extends away from the first coupling region **102**k. The retaining fork **102** can also have a recess **102**v, e.g. in the retaining region **102**a, which recess is arranged between the two retaining sections **202**. The retaining fork **102**, e.g. its retaining region **102**a, can be penetrated by the recess **102**v along direction **101**.

The retaining fork **102** makes it easier to retrofit an already existing drainage system with the channel-retaining device **200**. Clearly, the drainage channel, when retained by the channel-retaining device **200**, can extend into the recess **102**v.

FIG. **4** shows a channel-retaining device **200** according to various embodiments **400** in a schematic side view or cross-sectional view, in which the joint **106** is joined together in a form fit by means of a coupling component **106**f. This makes assembly easier.

The coupling component **106**f can, for example, be a materially bonded part of one of the two coupling regions, but does not have to be. The coupling component **106**f can, for example, also be provided as a separate component, e.g. by means of a screw, a spindle, or a rivet.

Optionally, the coupling component **106**f can have a thread. The coupling component **106**f can be inserted, for example, through the first coupling region **102**k and/or through the second coupling region **104**k.

In order to bring the locking device **108** into the first state, a force can be generated by means of the locking device **108**, which force presses the two coupling regions **102**k, **104**k against one another. This achieves a force fit between the two coupling regions **102**k, **104**k, which locks them together.

Optionally, the locking device **108** can be coupled to the coupling component **106**f. This simplifies construction and assembly. For example, the locking device **108** can have a thread which engages the thread of the coupling component **106**f. For example, the locking device **108** can have a nut (e.g. a wing nut) which can be screwed onto the coupling component **106**f. To bring the locking device **108** into the second state, the nut can be loosened.

In principle, the locking device **108** can also be provided separately from the joint **106**. For example, the locking device **108** can have or be formed from a screw connection adjacent the joint **106**.

FIG. **5** shows a channel-retaining device **200** according to various embodiments **500** in a schematic perspective view, in which the retaining holder **102** has several profiled rails **302** (also referred to as profile rails). For example, each retaining section **202** can have a profile rail **302**. It can be understood that the rails **302** do not necessarily need to be profiled.

A profile rail **302** can generally have a profiled surface. The profile rail **302** enables a form fit between the channel-retaining device **200** and the drainage channel or the frame and thus facilitates assembly. For example, the profile rail can have a groove **302**v (also referred to as a holder) which is delimited by the bearing surface **102**f.

A profile rail **302** can, for example, have several walls which are at an angle to one another and delimit the groove **302**v. For example, a first wall **302**a of the profile rail **302** can extend in plane **101**, **103** and have the bearing surface **102**f. For example, at least one second wall **302**b of the profile rail **302** can extend in plane **105**, **103**. In the case of a non-profiled rail **302**, the at least one second wall **302**b can be omitted.

The first coupling region **102**k may optionally include a plate-shaped section and a clamp **304** that encompasses the second coupling region **104**k to form the coupling between the first coupling region **102**k and the second coupling region **104**k. However, the clamp **304** can also be part of the second coupling region **104**k and encompass the first coupling region **102**k. The clamp **304** can extend into openings in the plate-shaped section, which facilitates assembly.

The locking device **108** (concealed in the illustration) can optionally be configured as a clamping device, by means of which the coupling region encompassed by the clamp **304** can be clamped in order to lock the first coupling region **102**k and the second coupling region **104**k together. For example, the locking device **108** can be configured to transfer a force to the clamp **304**, which presses the first coupling region **102**k and the second coupling region **104**k against one another to form the force fit. The clamping device can be part of the first coupling region **102**k or of the second coupling region **104**k, for example.

Optionally, the retaining region **102**a (e.g. each of the retaining sections) can have at least one attachment structure.

As an attachment structure, the retaining region **102**a can have a second wall **302**b, for example, which tapers in the direction of the bearing surface **102**f (also referred to more generally as a joining device **302**b). This means that the second wall **302**b has at least one freestanding section **312** (also referred to as a tab **312**). By means of the or each tab **312**, for example, the frame can be better attached, as will be described later in more detail.

As an attachment structure, the retaining region **102**a can have, for example, at least one passage opening **442**, so that the frame can be screwed or riveted to the retaining region **102**a. As an attachment structure, the retaining region **102**a can have, for example, at least one thread (not shown) into which a screw (not shown) attaching the frame can be screwed.

As illustrated, the retaining socket **104** may include at least one strut **1502**, e.g. several struts. The strut **1502** may optionally (at least in the second coupling region **104**k) be ribbed (i.e. have ribs). This improves the coupling with the first coupling region **102**k, since the force fit causes a form fit at the same time, which blocks a degree of freedom in direction **105**. The strut **1502** may be a rolled steel product, for example. For example, reinforcing steel (also referred to as rebars) can be used as a strut, which is especially inexpensive.

The several struts **1502** can be connected to one another in an articulated manner by means of the retaining holder **102** (e.g. its coupling region **102**k) so that they form a linkage. The articulation can be eliminated by means of the locking so that the several struts **1502** are also locked relative to one another. Clearly, the linkage can be prepared easily and with few resources and then locked more easily as soon as the desired alignment has been set.

If the linkage is formed using reinforcing bars, these do not necessarily have to be supplied as they are available at most construction sites. This reduces storage costs.

In one example, the retaining socket **104** may include at least one strut **1502** which inserts into the clamp **304** from below, as shown. The strut **1502** inserted in this way extends more in direction **105** than direction **103**, for example. As an alternative or in addition, the retaining socket **104** may include at least one strut **1502** (not shown) which inserts into the clamp **304** from the side. The strut **1502** inserted in this way extends more in direction **103** than direction **105**, for example. In principle, however, the entire strut **1502** does not have to be straight (but it can, which increases its stability). For example, the strut **1502** (e.g. a reinforcing bar **1502**) may be curved and/or angled. At least the end section (also referred to as the end-face section) of the strut **1502**, which is inserted into the clamp **304** as the second coupling region **104**k, can then be inserted into the clamp **304** from below or from the side. In other words, the strut **1502** can be extended essentially transversely to direction **101**, at least on the end face or completely.

FIG. **6** shows a clamping device **600** according to various embodiments in a schematic side view or cross-sectional view, in which the clamping device **600** has two clamping components **304**a, **304**b. The two clamping components **304**a, **304**b, when joined together, may form an opening **304**o (also referred to as clamp opening **304**o) for accommodating a coupling region (e.g. the first coupling region **102**k or the second coupling region **104**k). The clamp opening **304**o can be configured, for example, to accommodate at least one strut of the retaining socket **104** in the installed state, as will be described in more detail later.

The accommodated coupling region can, for example, be configured in relation to the shape and/or size of the clamp opening **304**o such that the two clamping components **304**a, **304**b press against the coupling region (also referred to as clamps) accommodated in the clamp opening **304**o when they are moved towards one another.

The locking device **108** may be configured, when placed in the first state, to impart a force on the two clamping components **304**a, **304**b which moves them towards one another. This means that the retaining holder **102** and the retaining socket **104** can be locked together by means of a force fit.

For example, a first clamping component **304***a* may be plate-shaped (e.g. having a plate section). For example, a second clamping component **304***b* may be clamp-shaped (e.g. provided by the clamp **304**). The clamp **304** is an especially inexpensive clamping component. Other examples of clamping components **304***a*, **304***b* include: a U-bolt, a hook bolt, a clamping plate, a press connector, a quick connector.

FIG. **7** shows a clamp-shaped clamping plate **304***b* (e.g. provided by means of the clamp **304**) according to various embodiments **700** in a schematic perspective view. The clamping plate **304***b* can, for example, have a folded plate or be formed therefrom. The clamping plate **304***b* can have at least one passage opening **502** for accommodating the coupling component **106***f*. The clamping plate **304***b* can have a depression **602***v* for forming the clamp opening **304***o*.

Optionally, the clamping plate **304***b* can have several projections **504** which engage the other clamping component **304***a*. This facilitates assembly as the interlocking components are secured against twisting.

The depression **602***v* can optionally have two tabs **612** between which the passage opening **502** is arranged. This facilitates assembly, since the struts can be inserted into the tabs **612** before locking.

Optionally, the passage opening **502** can have a thread so that it is possible to screw directly into it. This simplifies assembly.

Further exemplary implementations of the channel-retaining device **200**, inter alia in connection with the drainage system **100**, are explained below.

FIG. **8** shows a channel-retaining device **200** according to various embodiments **800** in a schematic perspective view, in which the retaining holder has an additional joint **116** (also referred to as a second joint **116**). The second joint **116** may be separate from joint **106** (also referred to as the first joint **106**). Alternatively, the functions of the second joint **116** may be integrated into the first joint **106**.

The first joint **106** (e.g. a rotary joint) can provide the retaining region **102***a* and the retaining socket **104** with more degrees of rotational freedom relative to one another than the second joint **116**. The second joint **116** (e.g. a sliding joint) can provide the retaining region **102***a* and the retaining socket **104** with more degrees of translational freedom relative to one another than the first joint **106**.

The second joint **116** can have a parallel guide, for example, which is provided by means of two slot-shaped passage openings. This prevents tilting of joint **116**.

Optionally, the channel-retaining device **200** can have an additional locking device (not shown), which is configured to be placed in a first state to block the at least one translational degree of freedom, so that the retaining region **102***a* and the retaining socket **104** are locked together, and placed in a second state to release the at least one translational degree of freedom, so that the retaining region **102***a* and the retaining socket **104** are movable relative to one another.

These separate joints **106**, **116** allow the orientation and position of the retaining region **102***a* to be adjusted sequentially, which facilitates assembly. The two joints **106**, **116** can be coupled to one another by means of an alignment plate **802**, for example.

As shown, the first coupling region **102***k* can have an elongated hole **804** into which the clamping component **304***a* (e.g. the clamp **304**) is inserted, as will be described later in more detail.

The retaining region **102***a* (also referred to as the attachment point) can optionally be formed in one piece with the inlet molding device **154** or can also be attached to it subsequently.

If the retaining region **102***a* is configured to be subsequently attached to the inlet molding device **154**, the retaining region **102***a* can have the attachment structure by means of which the inlet molding device **154** can be attached, e.g. in a form fit, force fit, or material bond.

The retaining holder **102**, for example its alignment plate **802**, has at least one recess, holder, and/or joining device **302***b*, by means of which the retaining socket **104** (for example its alignment means) can be attached. The position of the retaining socket **104** on the alignment plate **802** can preferably be locked in an adjustable manner, for example steplessly.

The connection of the retaining socket **104** to the retaining holder **102** can, for example, have at least one screw connection (e.g. by means of a U-bolt), have at least one clamping plate, have at least one press connector, have at least one cable tie, have at least one tie wire, etc.

FIG. **9** shows a drainage system **100** according to various embodiments **900** in a schematic perspective view, in which the first coupling region **102***k* has several passage openings, e.g. a curved elongated hole **804** as the first passage opening and a round bore as the second passage opening **814**. A U-bolt **304***a* can then be introduced into the several passage openings **804**, **814**. The U-bolt can then be rotated in a defined manner around the round bore, thus enabling an especially fine alignment of the inlet molding device **152**.

As an alternative or in addition to the U-bolt **304***a*, components for joining and/or locking the retaining holder **102** to the retaining socket **104** can have: at least one hook bolt, at least one clamping plate, at least one stud bolt, at least one rivet/weld nut, at least one rivet, at least one clinching connection (also known as a clinch connection), adhesive, a combination of guide pins/tabs, and screw connections.

FIG. **10** shows a channel-retaining device **200** according to various embodiments **1000** in a schematic side view or cross-sectional view, in which the channel-retaining device **200** has several first coupling regions **102***k*, e.g. at least one additional first coupling region **112***k*. Each first coupling region **102***k*, **112***k* can be configured to be joined to the retaining socket **104** (its second coupling region **104***k*).

If the first coupling region **102***k* is joined to the retaining socket **104**, the first joint **106** can be formed, which provides the retaining holder **102** and the retaining socket **104** with at least one rotational degree of freedom relative to one another. If the additional first coupling region **112***k* is joined to the retaining socket **104**, at least one rotational degree of freedom of the joint **106** can be blocked. The locking device **108** clearly implements this by means of the additional first coupling region **112***k*.

In other words, the locking device **108** can have the additional first coupling region **112***k*. Optionally, the locking device **108** can have an additional first joint, which is configured similarly to first joint **106**. For example, the additional first coupling region **112***k* can be symmetrical to first coupling region **102***k*. This means that initially the first coupling region **102***k* or initially the additional first coupling region **112***k* can be joined to the retaining socket **104** to form the first joint. This makes assembly easier.

Herein, inter alia, reference is made to a channel-retaining device **200** with only one first joint **106**, wherein the description for this can apply analogously to a channel-retaining device **200** with several first joints **106**, which, for example, mutually block their degrees of freedom in order to lock the channel-retaining device **200**.

Optionally, the second joint **116** can be arranged between the several first coupling regions **102***k*. This improves stability.

FIG. **11** shows a hook bolt **304***a* according to various embodiments **1100** in a schematic perspective view, which achieves an especially cost-effective construction, e.g. used as an alternative or in addition to the clamp **304**. The hook bolt **304***a* can serve, for example, as a coupling component **106***f* for joining the first coupling region **102***k* to the second coupling region **104***k*. The hook bolt **304***a* can serve as a clamping component for locking the channel-retaining device **200** in place, for example.

FIG. **12** shows an L-shaped clamping plate **304***b* according to various embodiments **1200** in a schematic perspective view, which achieves an especially cost-effective construction of the clamping device **600**, e.g. used as an alternative or in addition to the clamp **304**. The clamping plate **304***b* can serve, for example, as a clamping component for locking the channel-retaining device **200** and have several passage openings **502**.

FIG. **13** shows a retaining holder **102** according to various embodiments **1300** in a schematic perspective view, in which each joining device **302***b* has several tabs **312**. The joining device **302***b* can be configured to attach the inlet molding device **152** to the retaining holder **102** by means of reshaping the joining device **302***b*.

The joining device **302***b* can be designed as a separate component or be a monolithic component of the retaining holder **102**. The joining device **302***b* facilitates the attachment of the retaining holder **102** to the inlet molding device **152**, e.g. its frame. For attachment to the inlet molding device **152**, e.g. its frame, each joining device **302***b* can have two sheet metal tabs **312**, which can be bent over the leg of the frame, as shown below.

The tabs **312** enable fine adjustability of the inlet molding device **152** in a terrain, so that the surface of the inlet molding device **152** can be aligned more easily plane-parallel to the drainage surface **151**. Clearly, due to the form fit that is achieved by means of the tabs **312**, a translational degree of freedom is left open, according to which the retaining holder **102** can be displaced in direction **101** relative to the inlet molding device **152**.

The first coupling region **102***k* can have at least one slot-shaped passage opening (e.g. an elongated hole). A clamp **304**, for example, can be accommodated in this opening in order to provide a clamping device **600** and/or an anti-rotation device.

FIG. **14** shows a drainage system **100** according to various embodiments **1400** in a schematic perspective view, the tabs **312** of which are bent over the leg **1302** (a laterally protruding section) of the frame **1702**. The retaining holder **102** can be attached/clamped to the frame by bending the tabs **312** at the ends of the retaining holder **102**. In order to improve the clamping, the tabs can be beveled or at least tapered.

Additional examples of components of the joining device **302***b*, which are an alternative or in addition to the tabs **312**, can include: screws, nuts, rivets (e.g. self-piercing press rivets). This connection of the retaining holder **102** to the inlet molding device **152** does not necessarily have to be detachable.

Optionally, the frames of the inlet molding device **152** (a cast frame) and the first coupling region **102***k* may be a single piece (from one cast), e.g. provided together as a cast product. Thus, for example, no joining device **302***b* is required.

FIG. **15** shows a drainage system **100** according to various embodiments **1500** in a schematic perspective view, the attachment structure of which has at least one passage opening **442**, which achieves a form-fitting attachment of the inlet molding device **152**, e.g. its frame, on the separate retaining region **102***a*. Optionally, the retaining holder **102** can be connected to two frames.

FIG. **16** shows a channel-retaining device **200** according to various embodiments **1600** in a schematic side view or cross-sectional view, the retaining socket **104** of which has several struts **1502** positioned crossed to each other. The crossed struts **1502** may provide what is known as a truss (also referred to as a rod frame or strut truss). The truss, for example its struts, can be connected at so-called nodes **1502***k*. A node **1502***k* can have the end face of a strut **1502** or be arranged between the end faces of the strut **1502**, for example. The truss can have several struts **1502** which are at an angle to one another and which, for example, form a triangular truss.

In an especially simple implementation of the channel-retaining device **200**, the retaining socket **104**, e.g. its struts **1502**, is inserted into a soft foundation concrete **1500***u* and/or attached to formwork. Optionally, e.g., after the foundation concrete **1500***u* has hardened, the struts **1502** can be bent into position and/or shortened (e.g. adjusted in length). An even simpler implementation of the channel-retaining device **200** may include struts **1502** of appropriate length being driven directly into a subgrade **1500***u*.

In the case of an especially large distance between the inlet molding device **152** and the collecting pipe **154** (also referred to as the drainage pipe), the struts **1502** can be arranged on both sides of the collecting pipe **154**.

For example, the truss can be oriented along direction **101** (to stiffen the structure along its longitudinal extension) or transverse to direction **101** (to stiffen the structure across its longitudinal extension). For example, the truss can have at least one strut **1502**, which extends essentially in plane **101**, **105**. As an alternative or in addition, the truss can have at least one strut **1502**, which extends essentially in plane **103**, **105**. In an analogous manner, at least one strut of the truss can be extended at an angle to direction **105**. The truss can optionally be supported lateral to its direction of extension by means of so-called auxiliary struts.

FIG. **17** shows a channel-retaining device **200** according to various embodiments **1700** in a schematic side view or cross-sectional view, in which the truss has several struts **1502** positioned crossed to each other. This achieves an especially stable construction. The node points **1502***k* can optionally be formed at the points where the struts **1502** cross each other. Thus, the truss can have several struts **1502** which are at an angle to one another and which, for example, form a rhombic truss. What has been described for embodiments **1600** can apply analogously to embodiments **1700**. The truss can of course also have a combination of a rhombic truss and a triangular truss.

FIG. **18** shows a drainage system **100** according to various embodiments **1800** in a schematic perspective view, in which the first coupling region **102***k* has exactly one clamp-shaped first clamping component **304***a* and one plate-shaped second clamping component **304***b*, which can encompass several struts **1502** as support pillars. The several struts **1502** can, for example, be clamped and/or coupled to one another by means of the clamping component **304***b*. The frame **1702** and the drainage channel **1704** are also shown.

In more general terms, the clamping device **600** can have several components **304***a*, **304***b* which form a recess. The clamping device **600** or its recess can be configured in such a way that at least one support pillar (e.g. having one or more than one reinforcing bar **1502** and/or one or more than one plate) can be inserted into the recess. For example, the support pillar may extend essentially transversely to direction **101**. For example, the support pillar may extend essentially along plane **103**, **105**. For example, the recess can penetrate the clamping device **600** along a direction which lies essentially in plane **103**, **105**, e.g. along direction **105** and/or along direction **103**. Essentially, in association with an indication of direction, it can be understood as having an angular deviation from the indication of direction of less than approximately 20°, e.g. having less than approximately 10°, e.g. having less than approximately 5°.

In principle, however, the entire support pillar does not have to be extended only in one direction (but it can, which increases its stability). For example, the support pillar (e.g. its reinforcing bar **1502** and/or plate) may be curved and/or angled. At least the end section (also referred to as the end-face section) of the support pillar, which is inserted into the recess of the clamping device **600** as the second coupling region **104***k*, can then be extended essentially transversely to direction **101**. In other words, the support pillar can be extended at least on the end face or completely essentially transverse to direction **1001**.

In an even more stable example, the support pillar has an additional strut (also referred to as an auxiliary strut, not shown) which is coupled (e.g. welded, screwed, and/or using tie wire) to strut **1502** at a node point **1502***k* of strut **1502**, which is at a distance from the first coupling region **102***k* or second coupling region **104***k*. For example, the auxiliary strut may be supported at a different location than strut **1502** to provide a truss. The auxiliary strut can be supported, for example, in subsoil, in a pipe-retaining device, and/or on formwork.

As can be seen (at the back of the picture), the drainage channel does not necessarily have to be linear (i.e. straight) but can be retained by means of one or more than one channel-retaining device **200** in such a way that it has one or more than one corrugation.

As can be seen (middle of figure), the inlet molding device **152** (e.g. its frame) does not necessarily have to have all inlet openings **2302** in open form but rather at least one inlet opening **2302** can be closed (in this case representing a cover element which covers the inlet opening).

FIG. **19** shows the drainage system **100** according to various embodiments **1900** in a schematic perspective view, in which the retaining socket **104** has a pipe-retaining device **1802**. The pipe-retaining device **1802** allows the struts **1502** to be attached to the pipe-retaining device **1802** as an alternative or in addition to attaching/inserting them in the ground or in concrete.

The pipe-retaining device **1802** may include a passage opening **1802***o* (also referred to as pipe-retaining opening **1802***o*) for retaining the collecting pipe **154**. In principle, the pipe-retaining device **1802** can be in one piece and the collecting pipe **154**, for example its pipe section, can be inserted into the pipe-retaining opening **1802***o*. This increases stability. Alternatively, the pipe-retaining device **1802** can be in several parts. The pipe-retaining device **1802** can optionally have bendable sheet metal tabs, by means of which the pipe-retaining device **1802** can be attached to the collecting pipe **154**. To do this, the sheet metal tabs are bent in the direction of the collecting pipe **154**.

The retaining socket **104** may optionally include an attachment structure **1802***a* (also referred to as a strut attachment structure) which couples several struts **1502** to one another and/or couples them to the pipe-retaining device **1802**. Optionally, the strut attachment structure **1802***a* (e.g. a plate) may protrude laterally from the pipe-retaining device **1802** and/or be located between the pipe-retaining opening **1802***o* and the retaining holder **102**. This achieves greater stability.

For example, the strut attachment structure **1802***a* may have at least one passage opening, recess, or the like to attach the struts **1502**. The connection between a strut **1502** and the strut attachment structure **1802***a* can, for example, take place analogously to its attachment to the first coupling region **102***k*. Examples of optional components of the strut attachment structure include: a plate, screws, cable ties, tie wire, hook bolt, bracket.

As an alternative or in addition, the struts **1502** may be welded to a plate of the strut attachment structure **1802***a*. For example, the struts **1502** can first be welded at the bottom to the strut attachment structure **1802***a* or the pipe-retaining device **1802** and then be adjustably attached to the retaining holder **102** at the top, or in reverse order.

Optionally, a bottom section **104***f* of the retaining socket **104**, e.g. its pipe-retaining device **1802**, can be widened on a side opposite the second coupling region **104***k* (then also referred to as the base leg **1802**). This inhibits the retaining socket **104** from sinking into soft subsoil, thus facilitating assembly. For example, the base leg **1802** can be widened in direction **101**.

As shown, each retaining socket **104** can have exactly one pipe-retaining device **1802** which is coupled to the retaining holder **102** by means of at least one strut **1502**. Optionally, the retaining socket **104** can have several pipe-retaining devices **1802**, of which all pipe-retaining devices **1802** are coupled to the same retaining holder **102** by means of at least one strut **1502**. For example, the channel-retaining device **200** may include one or more than one strut **1502** (also referred to as a main strut **1502**) which couples the retaining holder **102** to a first pipe-retaining device **1802** immediately below. For example, the channel-retaining device **200** may include one or more than one additional strut (also referred to as an auxiliary strut) which couples the retaining holder **102** to a second pipe-retaining device **1802** arranged next to the first pipe-retaining device **1802**.

In a similar manner, the pipe-retaining device **1802** may have several retaining holders **102** as an alternative or in addition, of which all retaining holders **102** are coupled to the same channel-retaining device **200** by means of at least one strut **1502**.

In this way, a truss can clearly be formed. The auxiliary strut can, for example, be coupled directly to the retaining holder **102** and/or a pipe-retaining device **1802**, e.g. through contact. Alternatively, the auxiliary strut can be coupled indirectly (e.g. by means of a strut **1502**) to the retaining holder **102** and/or the pipe-retaining device **1802**, so that this strut is at a distance from the retaining holder **102** or the pipe-retaining device **1802**. For example, the auxiliary strut can be connected to a strut **1502** e.g. by means of tie wire.

As can be seen, the inlet molding device **152** (e.g. its frame) does not necessarily have to be open at the top, but can also be provided without inlet openings **2302** and/or can have closed inlet openings **2302**.

FIG. **20** shows the drainage system **100** according to various embodiments **2000** in a schematic perspective view, in which the pipe-retaining opening **1802***o* is arranged between two struts **1502**. This can make assembly easier, particularly in the case of a low overall height.

FIG. **21** shows a spacer plate **2100** according to various embodiments in a schematic perspective view as an exemplary component of the retaining socket **104**. For example, the retaining socket **104** can have at least one spacer plate **2100**, as an alternative or in addition to struts **1502**. It can be understood that what is described herein for struts **1502** may apply to spacer plates **2100** by analogy. For example, instead of a strut **1502**, a spacer plate **2100** can be used, which couples the pipe-retaining device **1802** to the retaining holder **102**, e.g. by screwing them together.

In the second coupling region **104***k*, the spacer plate **2100** can have at least one slot-shaped passage opening (e.g. elongated holes), which provides a translational degree of freedom. This makes it easier to adjust the height of the inlet molding device **152**. As an alternative or in addition, the spacer plate **2100** can have at least one slot-shaped passage opening (e.g. elongated holes) on a side opposite the second coupling region, which provides a translational degree of freedom.

FIG. **22** shows an assembly **2200** of the drainage system **100** according to various embodiments in a schematic side view, FIG. **23** shows the assembly **2200** in a schematic sectional view A-A, and FIG. **24** shows the assembly **2200** in a schematic sectional view B-B. Several assemblies **2400** can be mounted individually and/or joined together to form the drainage system **100**. For example, the assembly **2400** may have an expansion along direction **101** in a range from about 0.25 meters (e.g. 0.5 meters) to about 4 meters (e.g. 2 meters). For example, the assembly **2400** may have an expansion along direction **105** in a range from about 1 meter to about 3 meters and/or greater than the expansion along direction **101**.

The frame **1702** can cover the drainage channel **1704** and encompass it on both sides. Furthermore, the frame **1702** can have several inlet openings **2302** arranged one behind the other along direction **101**, of which each inlet opening **2302** optionally extends longitudinally along direction **101**. This improves the water absorption rate.

Optionally, the retaining holder **102** can be connected to two frames (e.g. per assembly **2200**).

The drainage channel **1704** can have several funnel-shaped depressions **1704***t* (also referred to as funnels), of which each funnel **1704***t* opens into a drop opening **2304**. Each of the drop openings **2304** may be coupled to a downpipe **156**. This improves the water flow.

For example, a wavy drainage surface can be drained by means of the setting options described herein, which the channel-retaining device **200** provides. As an alternative or in addition, it is also possible to form a drainage line from a plurality of assemblies **152**, which extends in a meandering manner in direction **101**. The drainage line can be extended incrementally according to the length of the frame (e.g. 0.5 meters, 1 meter, or 2 meters).

FIG. **25** shows the drainage system **100** according to various embodiments **2500** in a schematic perspective view, in which the retaining socket **104** has several pipe-retaining devices **1802**, of which a first pipe-retaining device **1802** is coupled to a retaining holder **102** by means of at least one main strut **1502** and of which a second pipe-retaining device **1802** is coupled to the same retaining holder **102** by means of at least one auxiliary strut **1502***h*. As an alternative or in addition, the channel-retaining device **200** can have several retaining holders **102**, of which a first retaining holder **102** is coupled to one (e.g. the first) channel-retaining device **200** by means of at least one main strut **1502** and of which a second retaining holder **102** is coupled to the same channel-retaining device **200** by means of at least one auxiliary strut **1502***h*. By analogy, the channel-retaining device **200** can also have more than two pipe-retaining devices **1802** and/or more than two retaining holders **102**.

Various examples are described below which relate to those described above and shown in the figures.

Example 1 is a channel-retaining device, comprising: a retaining holder having a first coupling region and a retaining region for retaining a drainage channel extending along one direction; an optional retaining socket having a second coupling region; wherein the first coupling region and the second coupling region are configured to be joined together to form a joint which provides the retaining holder and the retaining socket with at least one rotational degree of freedom relative to one another, which is, for example, essentially along the direction, and/or at least one translational degree of freedom relative to one another, which is, for example, essentially transverse to the direction; a locking device which is configured, when placed in a first state, to block the at least one rotational degree of freedom and/or the at least one translational degree of freedom, so that the retaining holder and the retaining socket are locked together, and, when placed in a second state, to release the rotational degree of freedom, so that the retaining holder and the retaining socket are movable relative to one another.

Example 2 is a channel-retaining device, comprising: a retaining holder having a first coupling region and a retaining region for retaining a drainage channel extending along one direction; an optional retaining socket having a second coupling region; wherein the first coupling region and the second coupling region are configured to be joined together to form a joint which connects the retaining holder and the retaining socket to one another in a rotatable and/or displaceable manner, wherein an axis of rotation of the joint, for example, is essentially along the direction; a locking device which is configured, when placed in a first state, to block the rotation and/or displacement of the retaining holder and the retaining socket as relates to one another, so that they are locked together, and, when placed into a second state, to release the locking.

Example 3 is a channel-retaining device, comprising: a retaining holder which has a clamping device (e.g. having a clamp or at least a clamp-shaped plate) and a retaining region for retaining a drainage channel (e.g. extending along one direction); wherein the clamping device has a recess (e.g. penetrating the at least clamping device essentially transversely to the direction), which is configured to accommodate at least one support pillar (e.g. reinforcing bar) which (e.g. at least at the end face) is extended away from the retaining region (e.g. at least on the end face essentially transversely to the direction) and is configured (e.g. by means of the locking device), when placed in a first state, to clamp the at least one support pillar (which is optionally curved or angled) in such a way that the retaining holder and the at least one support pillar are locked together, and, when placed in a second state, to provide the at least one support pillar with a rotational degree of freedom essentially along the direction such that the retaining holder and the support pillar are connected to each other in an articulated manner or form a joint.

Example 4 is the channel-retaining device according to any one of Examples 1 to 3, wherein the retaining holder is fork-shaped (then also referred to as retaining fork); and/or wherein the retaining region has two retaining sections which are spatially separated from one another (e.g. each having a joining device); and/or wherein the retaining holder is penetrated by a recess essentially along the direction. This makes it easier to retrofit using the channel-retaining device.

Example 5 is the channel-retaining device according to any one of Examples 1 to 4, wherein the retaining socket has or is formed from a linkage, wherein the linkage has, for example, struts or rods (e.g. the reinforcing bars) which extend obliquely to one another (e.g. are crossed) (which are optionally curved or are angled), wherein the linkage is, for example, articulated when the locking device is in the second state and/or locked when the locking device is in the first state. This facilitates assembly and simplifies construction.

Example 6 is the channel-retaining device according to any one of Examples 1 to 5, wherein the retaining region (e.g. each of the retaining sections) has at least one rail. This makes it easier to retrofit using the channel-retaining device.

Example 7 is the channel-retaining device according to any one of Examples 1 to 6, wherein the retaining region (e.g. each of the retaining sections) has an attachment structure for attaching the drainage channel and/or a frame. This makes it easier to retrofit using the channel-retaining device.

Example 8 is the channel-retaining device according to any one of Examples 1 to 7, wherein the retaining region has a frame (e.g. extending essentially along the direction), e.g. a cast frame, which is, for example, a form-fitting component of the retaining region. This reduces the effort involved in assembly.

Example 9 is the channel-retaining device according to any one of Examples 1 to 8, wherein the retaining region is a cast product and/or comprises or is formed from cast steel. This improves stability.

Example 10 is the channel-retaining device according to any one of Examples 1 to 9, wherein the joint of the retaining holder and retaining socket additionally provides at least one (i.e. one or more than one) translational degree of freedom which is essentially transverse to the rotational degree of freedom. This facilitates precise assembly. The locking device may be configured to be placed in a first state to block the at least one translational degree of freedom, so that the retaining holder and the retaining socket are locked together, and, when placed in a second state, to release the at least one translational degree of freedom, so that the retaining holder and the retaining socket are movable relative to one another.

Example 11 is the channel-retaining device according to any one of Examples 1 to 10, wherein the retaining holder has an additional joint which provides the retaining region and the retaining socket with one translational degree of freedom relative to one another, wherein the joint and the additional joint, for example, are spatially separated from one another. This facilitates precise assembly.

Example 12 is the channel-retaining device according to any one of Examples 1 to 11, wherein the joint and/or the additional joint has a parallel guide for providing a translational degree of freedom. This facilitates precise assembly.

Example 13 is the channel-retaining device according to any one of Examples 1 to 12, wherein the joint and/or the additional joint is spatially separated from the retaining region.

This reduces the risk of damage to the drainage channel.

Example 14 is the channel-retaining device according to any one of Examples 1 to 13, wherein the first coupling region and the second coupling region are joined together (e.g. held together) by the locking device. This reduces the complexity of the design.

Example 15 is the channel-retaining device according to any one of Examples 1 to 14, wherein the retaining holder and the retaining socket are joined together engaging each other. This improves stability during assembly.

Example 16 is the channel-retaining device according to any one of Examples 1 to 15, wherein the retaining holder and/or the retaining socket has a plate. This reduces production costs.

Example 17 is the channel-retaining device according to any one of Examples 1 to 16, wherein the retaining socket has several crossed struts (e.g. reinforcing bars) (which are optionally curved or angled), e.g. providing a truss. This improves stability.

Example 18 is the channel-retaining device according to any one of Examples 1 to 17, further comprising: an opening formed in one retaining holder and retaining socket, and a protrusion formed in the other retaining holder and the retaining socket, wherein the protrusion engages the opening when the retaining holder and the retaining socket are joined together. This improves stability during assembly.

Example 19 is the channel-retaining device according to any one of Examples 1 to 18, wherein the retaining socket is configured to be placed upright on or inserted into the ground. This increases the application scope.

Example 20 is the channel-retaining device according to any one of Examples 1 to 19, wherein the first coupling region has several components which, when joined together, encompass and/or clamp the second coupling region, wherein the several components are secured against rotation and/or engagement, for example. This facilitates assembly.

Example 21 is the channel-retaining device according to any one of Examples 1 to 20, wherein the retaining socket has one or more than one (e.g. a one-piece or multi-piece) pipe-retaining device, of which each pipe-retaining device has a passage opening for accommodating a collecting pipe and/or of which each pipe-retaining device is coupled to the retaining holder (e.g. by means of at least one strut). This improves stability during assembly.

Example 22 is the channel-retaining device according to any one of Examples 1 to 21, wherein the retaining socket (e.g. its pipe-retaining device) has at least one (i.e. one or more than one) leg protruding along the direction. This improves stability.

Example 23 is the channel-retaining device according to any one of Examples 1 to 22, wherein the retaining socket has at least one (i.e. one or more than one) support pillar (which is optionally curved or angled) which, for example, provides the second coupling region and/or supports the retaining holder on the pipe-retaining device; wherein, for example, the or each support pillar has or is formed from a (optionally curved or angled) strut (e.g. a reinforcing bar) or a (optionally curved or angled) spacer plate. This reduces the complexity of the design.

Example 24 is the channel-retaining device according to any one of Examples 1 to 23, wherein the second coupling region (e.g. the or each support pillar) is ribbed or has a (e.g. slotted) passage opening. This simplifies assembly.

Example 25 is a drainage system (e.g. for surface drainage), comprising: a channel-retaining device according to any one of examples 1 to 24, a drainage channel which is extended essentially longitudinally along the direction and is retained by the retaining holder of the channel-retaining device, an optional frame which laterally encloses at least one segment of the drainage channel, wherein the frame has, for example, at least one longitudinal slot (e.g. longitudinal slots arranged one behind the other essentially along the direction), which is extended longitudinally essentially along the direction.

Example 26 is the drainage system according to Example 25, further comprising: at least one drop line (e.g. at least one downpipe) fluidly coupled to the drainage channel and extending away from the drainage channel (e.g. the side thereof on which the retaining holder is arranged). This increases the stability of the structure.

Example 27 is the drainage system according to Example 26, further comprising: a collecting line (e.g. a collecting pipe) which is essentially extended longitudinally along the direction (and, for example, is extended through a passage opening of the retaining socket); wherein the at least one drop line (e.g. the at least one downpipe) fluidly couples the drainage channel and the collecting line to one another; wherein, for example, a distance between the collecting line and the drainage channel is greater than an expansion of the collecting line (e.g. the downpipe) along the distance, wherein, for example, the retaining socket is supported on the collecting line (e.g. the downpipe). This increases the stability of the structure.

Example 28 is a method of assembling a drainage channel (e.g. as part of a drainage system according to any of Examples 25 to 27) using a channel-retaining device (e.g. according to any one of Examples 1 to 24), the method comprising: aligning a drainage channel which extends essentially longitudinally along the direction and is retained by means of the retaining holder of the channel-retaining device, wherein the aligning means that the retaining holder and the retaining socket are moved relative to one another according to the at least one translational degree of freedom and/or at least one rotational degree of freedom; and transitioning the locking device from the second state to the first state so that the retaining holder and the retaining socket are locked together.

Example 29 is the method according to Example 28, wherein the retaining socket is supported on or in subsoil (e.g. comprising soil or concrete) or by means of formwork (e.g. such that a weight of the drainage channel is supported by the channel-retaining device essentially in the direction of the removal of the formwork or subsoil). This increases the application scope.

Example 30 is the method according to Example 28 or 29, further comprising: embedding the drainage channel and the channel-retaining device in a material, e.g., such that the drainage channel is exposed to a surface of the material and/or is flush with the surface of the material. This increases the stability of the structure.

The invention claimed is:

1. A channel-retaining device (**200**), comprising:

a retaining holder (**102**) which has a first coupling region (**102***k*) and a retaining region (**102***a*) for retaining a drainage channel extending along a direction;

a retaining socket (**104**) which has a second coupling region (**104***k*) and comprises a linkage;

wherein the first coupling region (**102***k*) and the second coupling region (**104***k*) are configured to be joined together to form a joint (**106**) which provides the retaining holder (**102**) and the retaining socket (**104**) with one rotational degree of freedom (**111**) relative to one another which is essentially along the direction;

a locking device (**108**) which is configured to be placed in a first state to block the rotational degree of freedom (**111**), so that the retaining holder (**102**) and the retaining socket (**104**) are locked together, and which is configured to be placed in a second state to release the rotational degree of freedom (**111**), so that the retaining holder (**102**) and the retaining socket (**104**) are movable relative to one another,

wherein the linkage is articulated when the locking device (**108**) is in the second state and locked when the locking device (**108**) is in the first state.

2. The channel-retaining device (**200**) according to claim **1**, wherein the retaining holder (**102**) is fork-shaped.

3. The channel-retaining device (**200**) according to claim **1**, wherein the retaining region (**102***a*) has an attachment structure (**442**, **302***b*) for attaching the drainage channel.

4. The channel-retaining device (**200**) according to claim **1**, wherein the retaining region (**102***a*) has a frame (**1702**) which is a form-fitting component of the retaining region (**102***a*).

5. The channel-retaining device (**200**) according to claim **1**, wherein the joint (**106**) of the retaining holder (**102**) and the retaining socket (**104**) additionally provides one or more than one translational degree of freedom (**115**) which is essentially transverse to the rotational degree of freedom (**111**).

6. The channel-retaining device (**200**) according to claim **1**, wherein the first coupling region (**102***k*) and the second coupling region (**104***k*) are joined together by means of the locking device (**108**).

7. The channel-retaining device (**200**) according to claim **1**, wherein the retaining holder (**102**) and/or the retaining socket (**104**) has a plate.

8. The channel-retaining device (**200**) according to claim **1**, wherein the first coupling region (**102***k*) has several components (**304***a*, **304***b*, **304**) which, when joined together, encompass and/or clamp the second coupling region (**104***k*).

9. The channel-retaining device (**200**) according to claim **8**, wherein the several components are secured against rotation and/or engage with each other.

10. The channel-retaining device (**200**) according to claim **1**, wherein the retaining socket (**104**) has one or more than one pipe-retaining device (**1802**) which has a passage opening for accommodating a collecting pipe (**154**).

11. The channel-retaining device (**200**) according to claim **10**, wherein the retaining socket (**104**) has one or more than one support pillar (**1502**, **2100**) which supports the retaining holder (**102**) on the one or more than one pipe-retaining device (**1502**).

12. The channel-retaining device (**200**) according to claim **1**, wherein the second coupling region (**104***k*) is ribbed or has a slotted passage opening.

13. A drainage system (**100**), comprising:

a channel-retaining device (**200**) according to claim **1**;

a drainage channel (**1704**) which is extended longitudinally along the direction (**101**) and retained by the retaining holder (**102**) of the channel-retaining device (**200**).

14. The drainage system (**100**) according to claim **13**, further comprising:

at least one drop line (**156**) which is fluidly coupled to the drainage channel (**1704**) and extends away from the drainage channel (**1704**).

15. The drainage system (**100**) according to claim **14**, further comprising:

a collecting line (**154**) which is longitudinally extended along the direction (**101**);

wherein the at least one drop line (**156**) fluidly couples the drainage channel (**1704**) and the collecting line (**154**) to one another.

16. A method for assembling a drainage channel (**1704**) by means of a channel-retaining device (**200**) according to claim **1**, the method comprising:

aligning the drainage channel (**1704**) which is extended longitudinally along the direction and is retained by means of the retaining holder (**102**) of the channel-retaining device (**200**), wherein the aligning means that the retaining holder (**102**) and the retaining socket (**104**) are moved relative to each other according to the rotational degree of freedom (**111**);

transitioning the locking device (**108**) from the second state into the first state so that the retaining holder (**102**) and the retaining socket (**104**) are locked together.

17. The method according to claim **16**, wherein the retaining socket (**104**) is supported on or in subsoil or by means of formwork.

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