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(54) MOULD CORE FOR A MOULD FOR PRODUCING HOLLOW CONCRETE BODIES, AND A MOULDING DEVICE HAVING A MOULD CORE OF THIS KIND

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CPC B28B 7/306; B28B 7/348; B28B 21/88
See application file for complete search history.

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(57) **ABSTRACT**

The present disclosure relates to a mold core for use on a molding apparatus for the production of hollow and/or in particular tubular concrete bodies, and a molding apparatus comprising such a mold core. The mold core comprises a longitudinally extending wall of the core, which has a wall of the core from one end to the other end of the wall of the core in the longitudinal direction, an expansion device for expanding and/or spreading and/or contracting and/or shrinking the mold core, and a sealing element sealing the longitudinal opening of the wall of the core. The sealing

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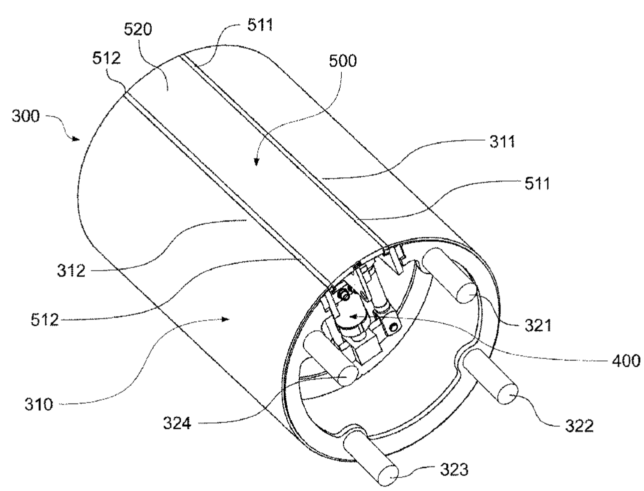

element is provided with respective longitudinal edges of the wall of the core by means of a detachable connection, the sealing member being slidably connected to the two longitudinal edges of the wall of the core in the longitudinal direction, respectively.

13 Claims, 15 Drawing Sheets

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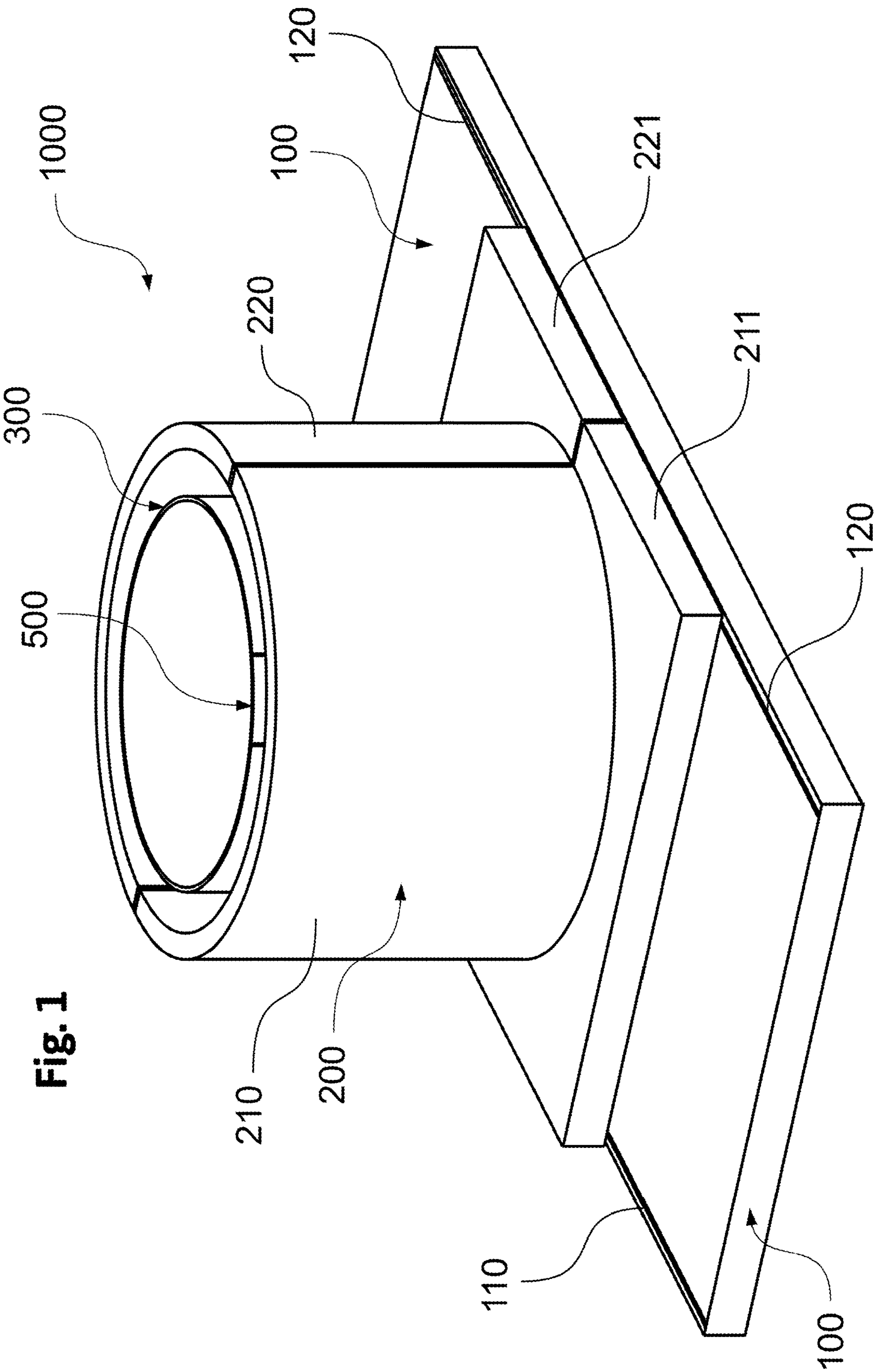
Fig. 1



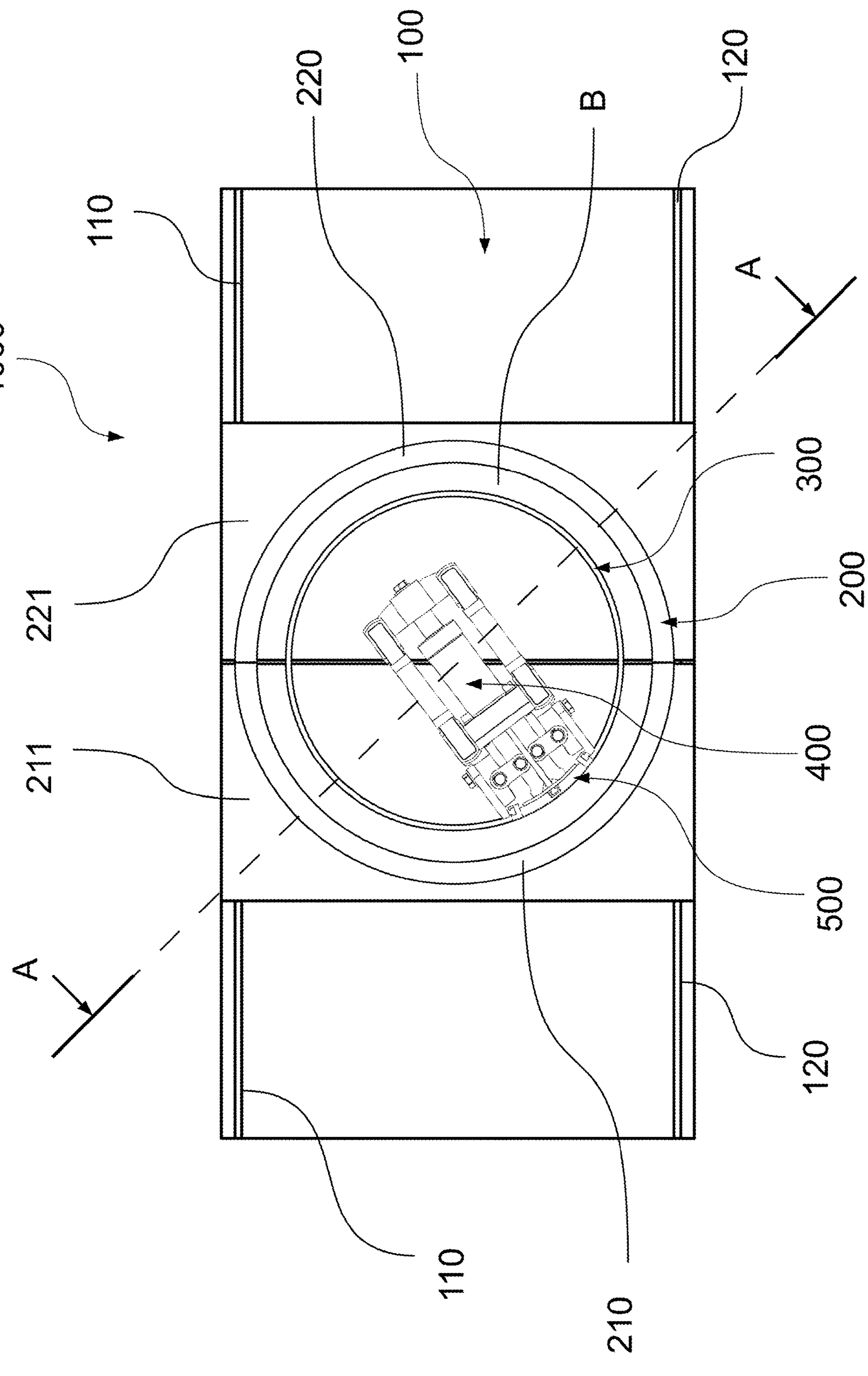


Fig. 2

Fig. 3

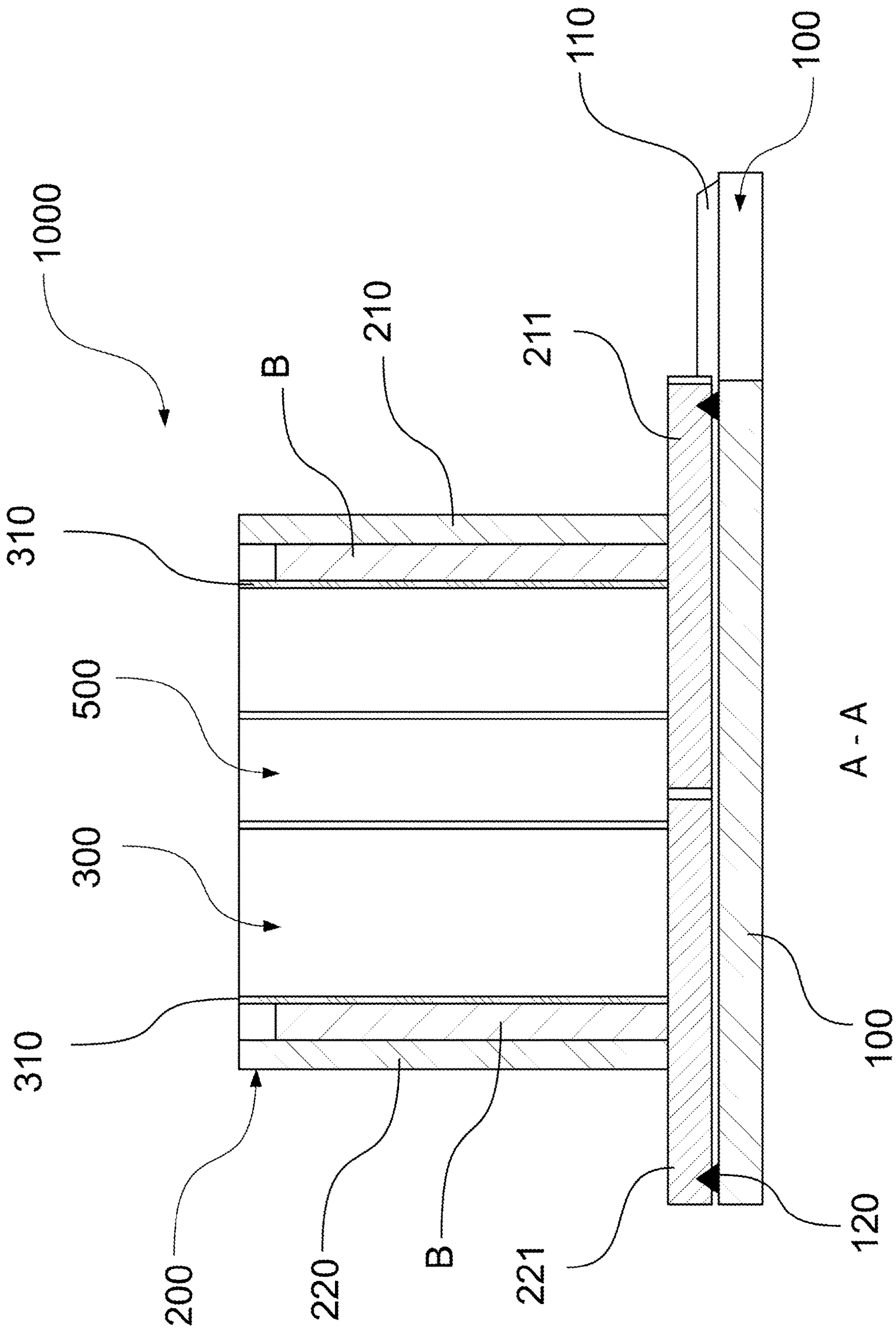
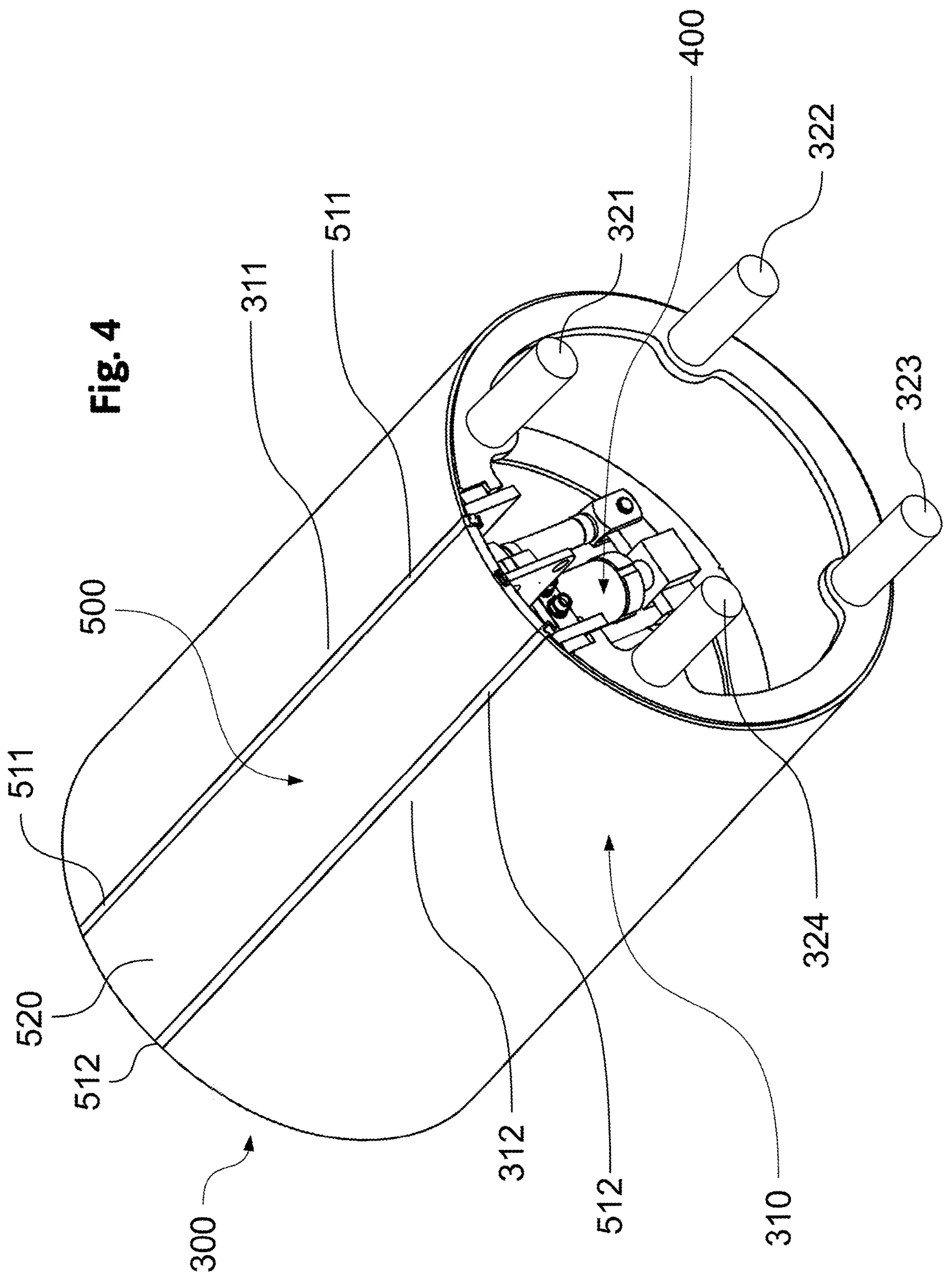


Fig. 4



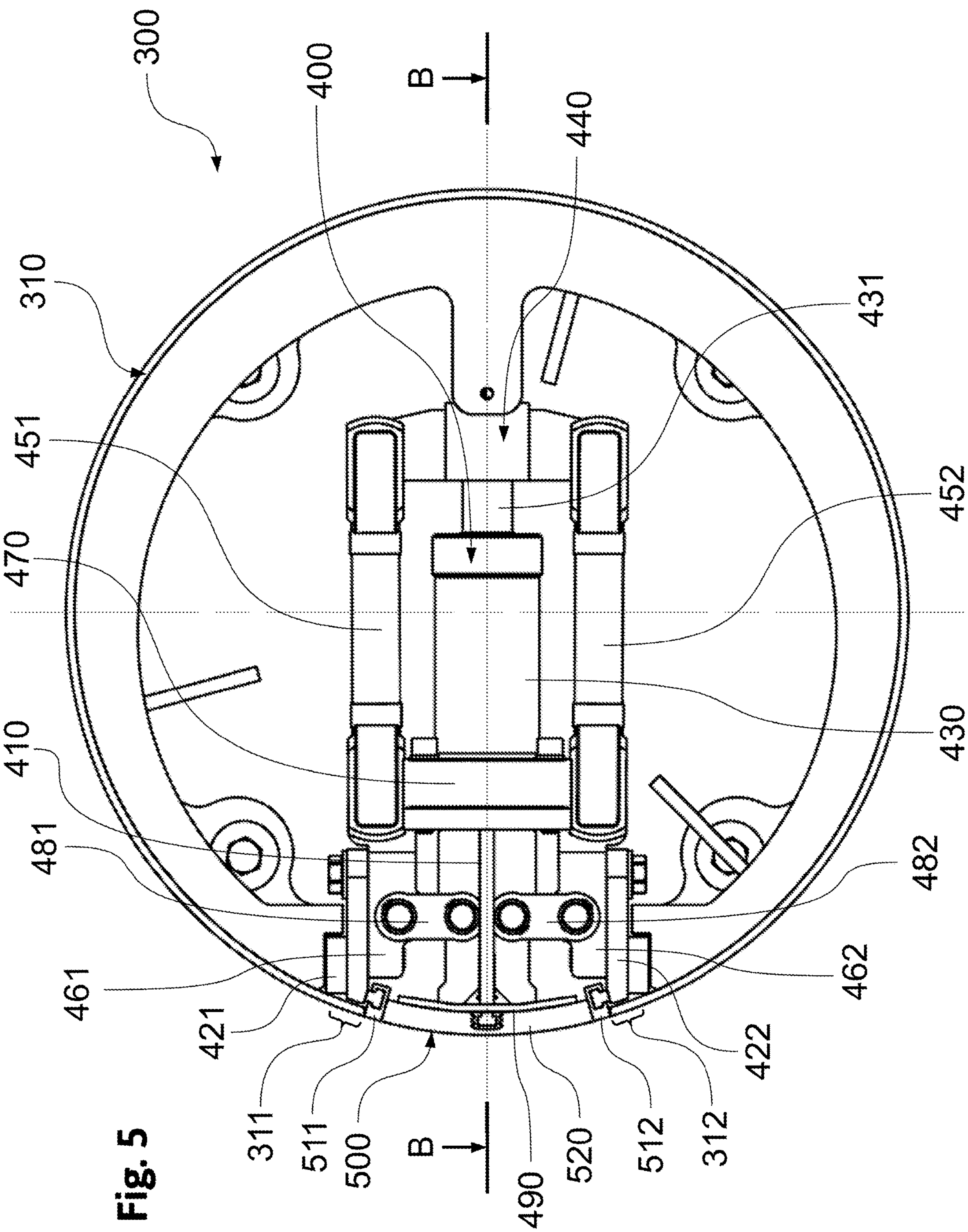

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Fig. 5

Fig. 6

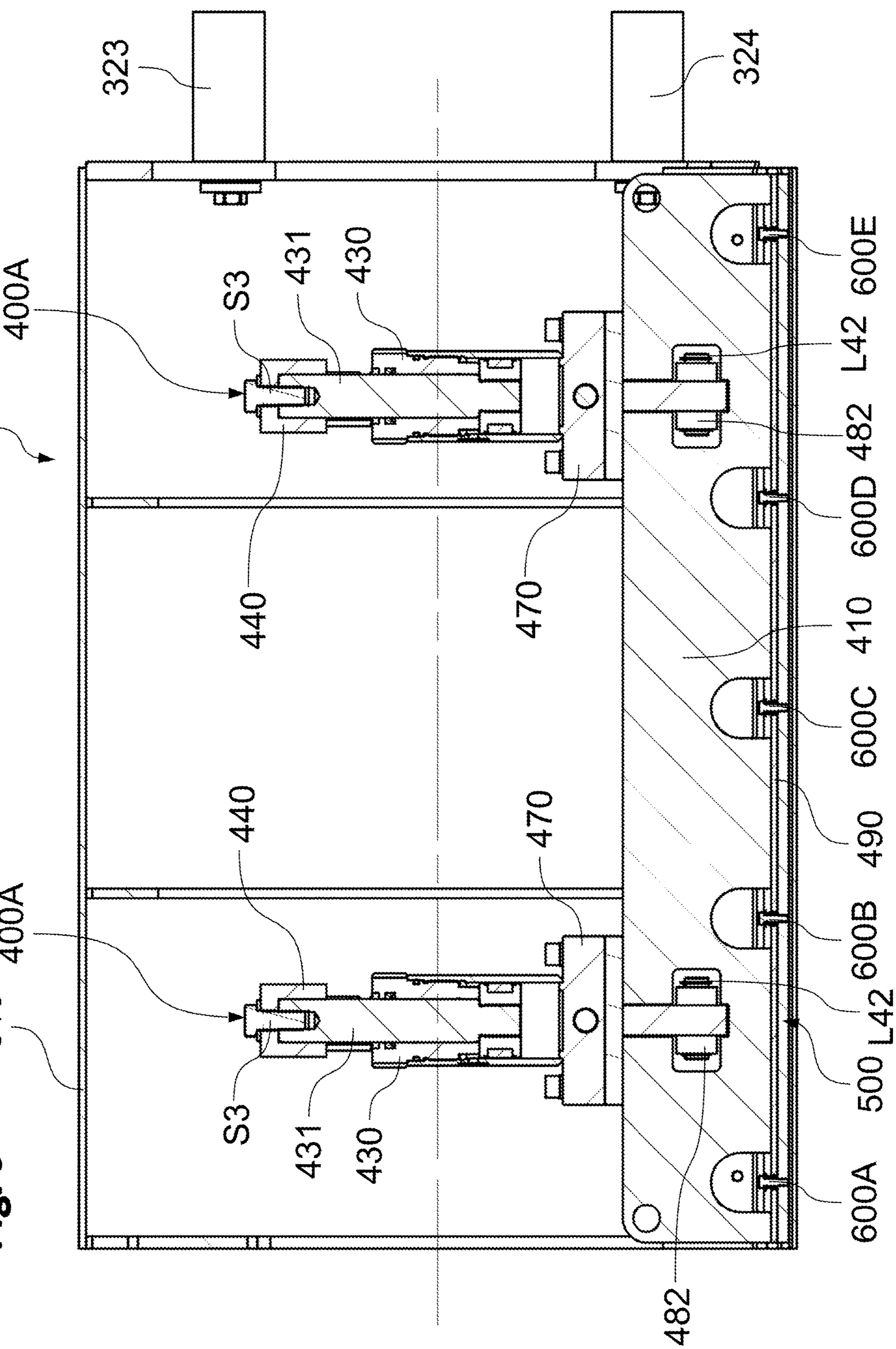
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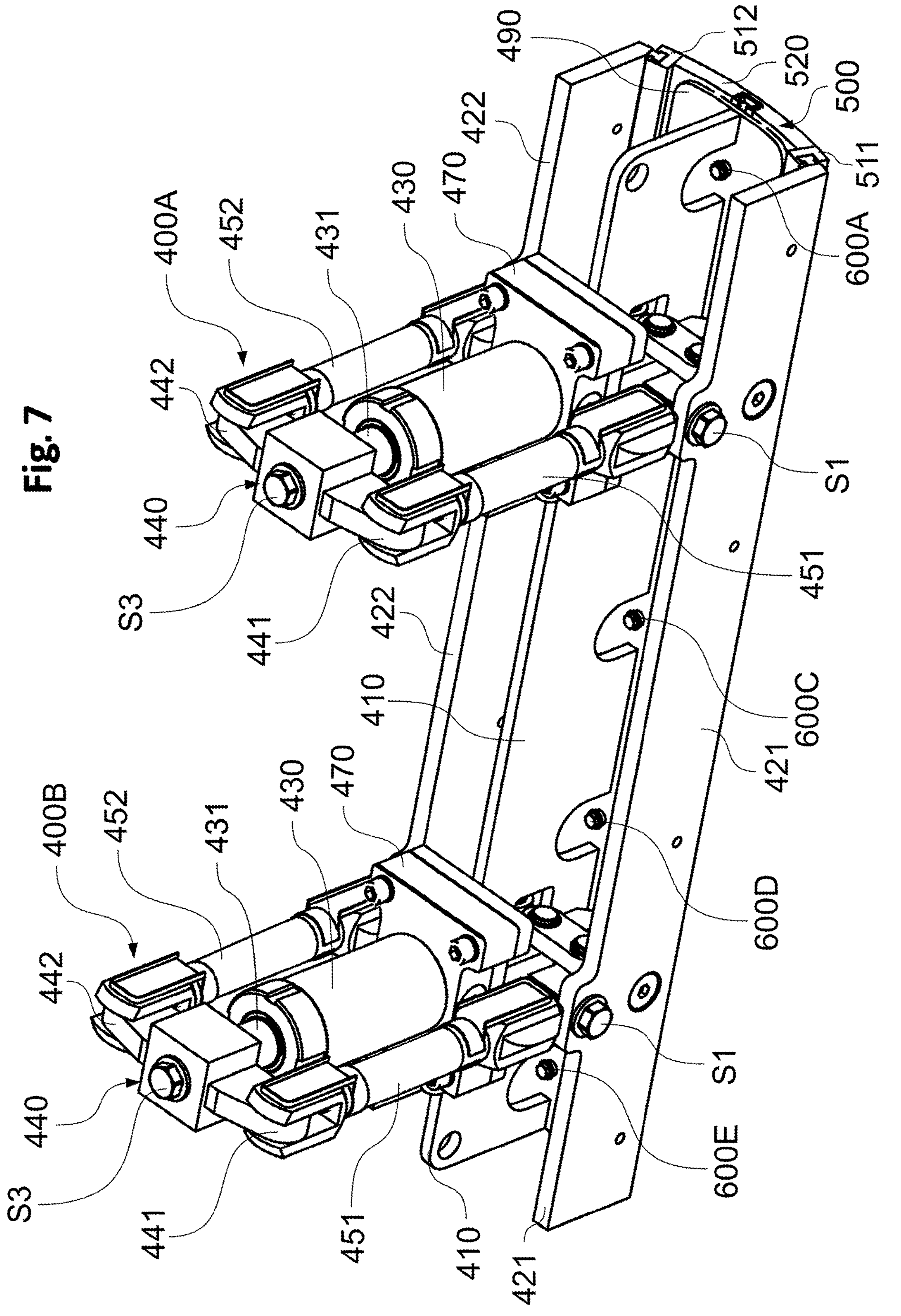
Fig. 7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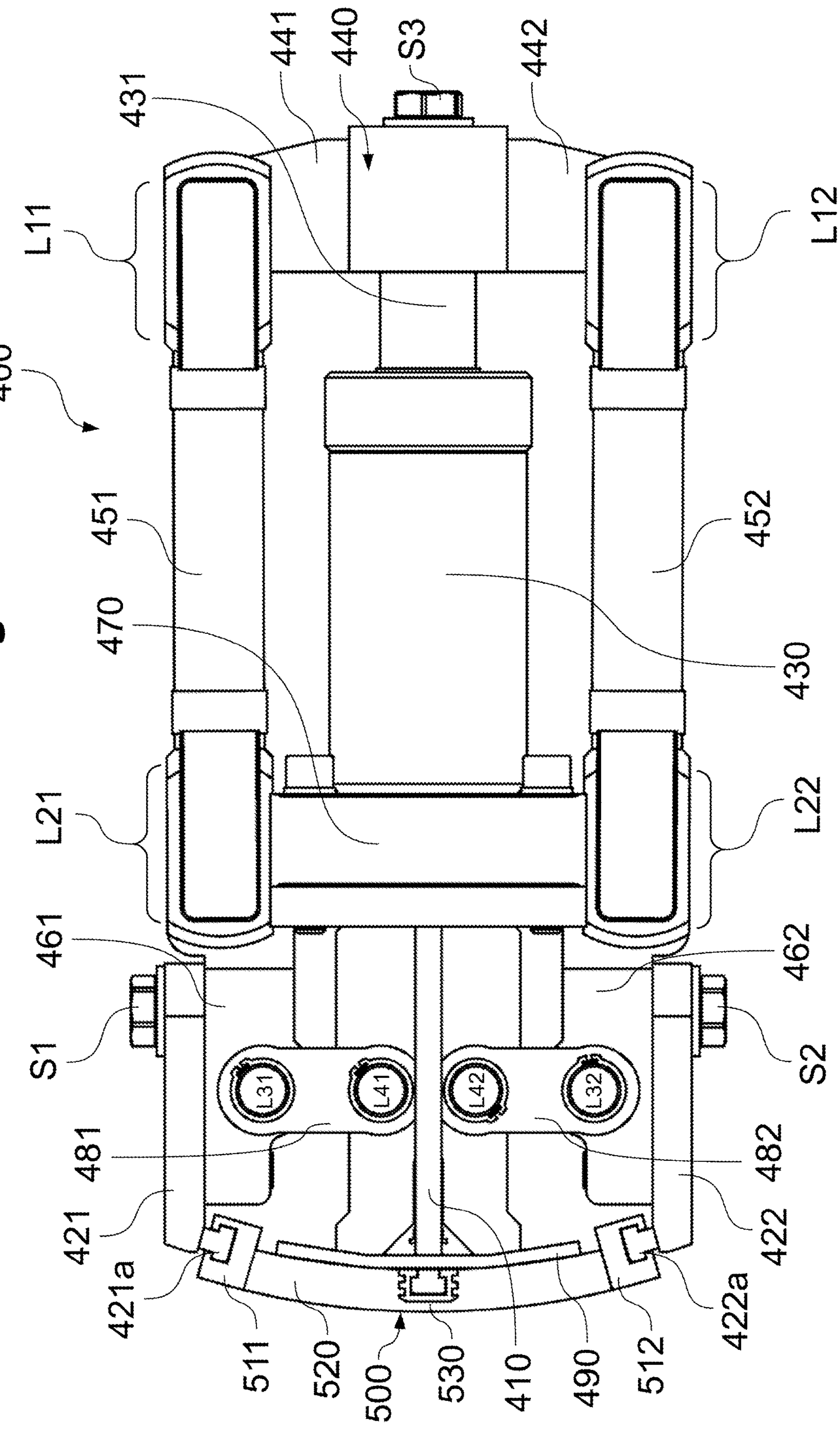
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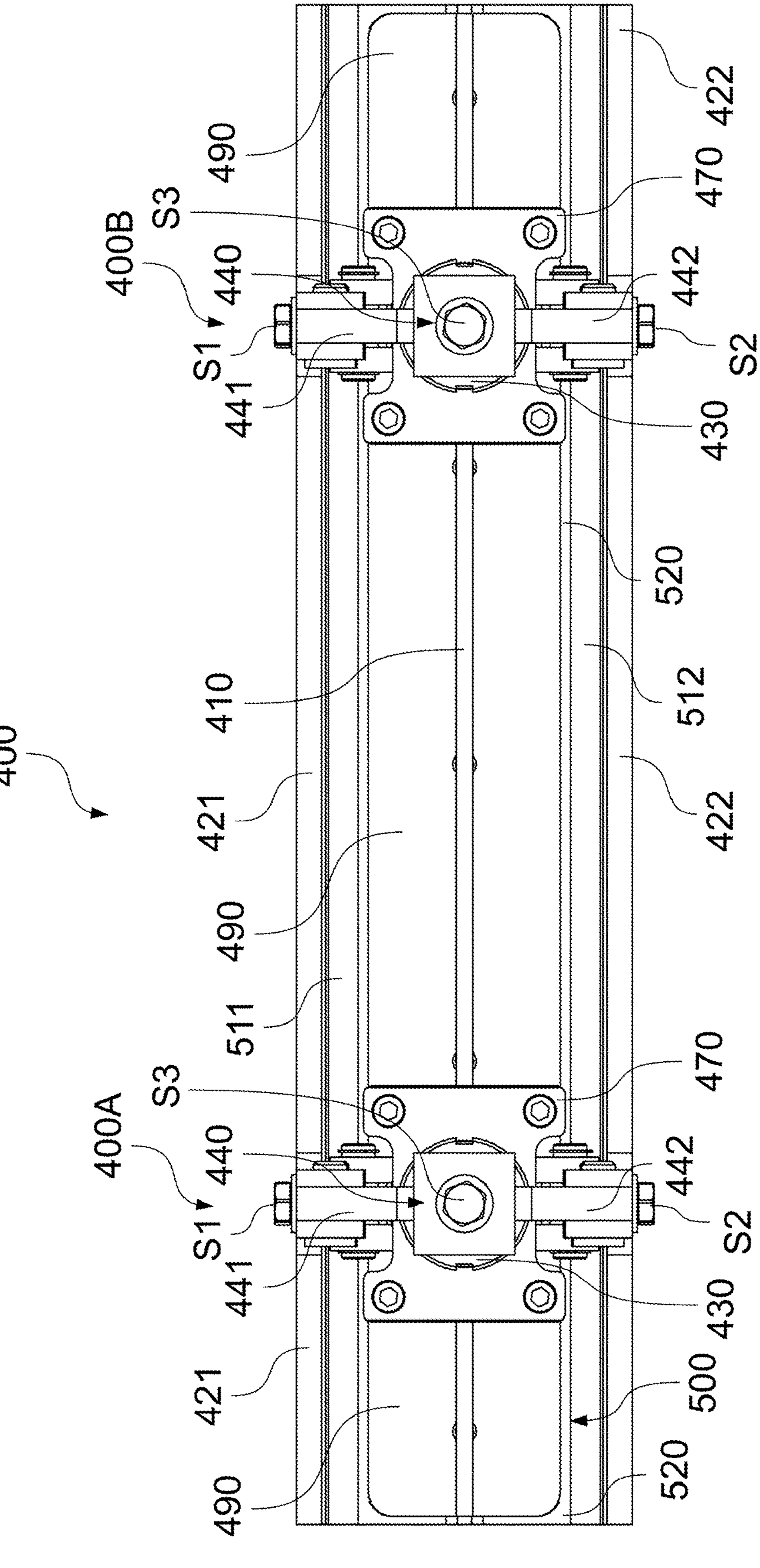
Fig. 8

Fig. 9



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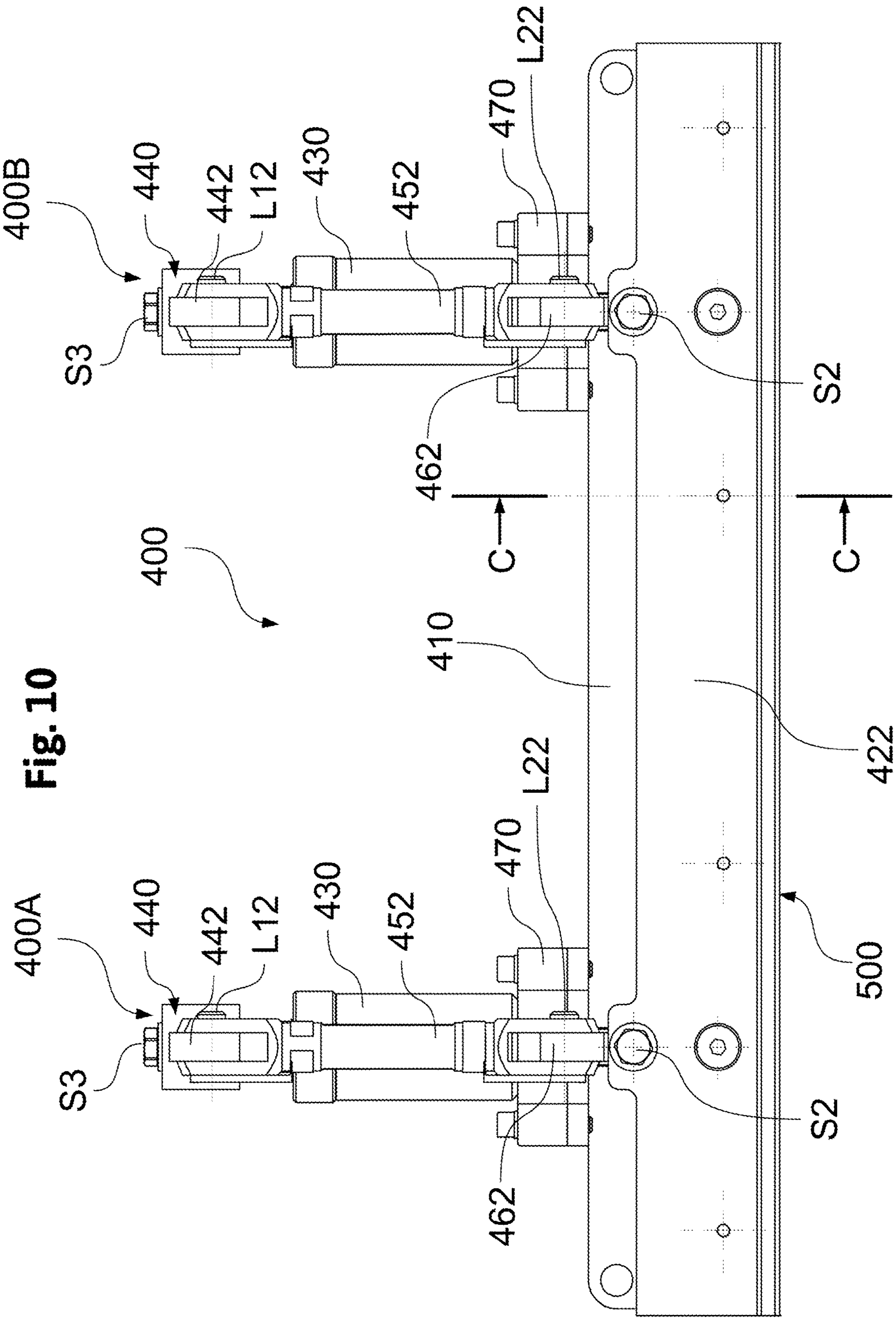
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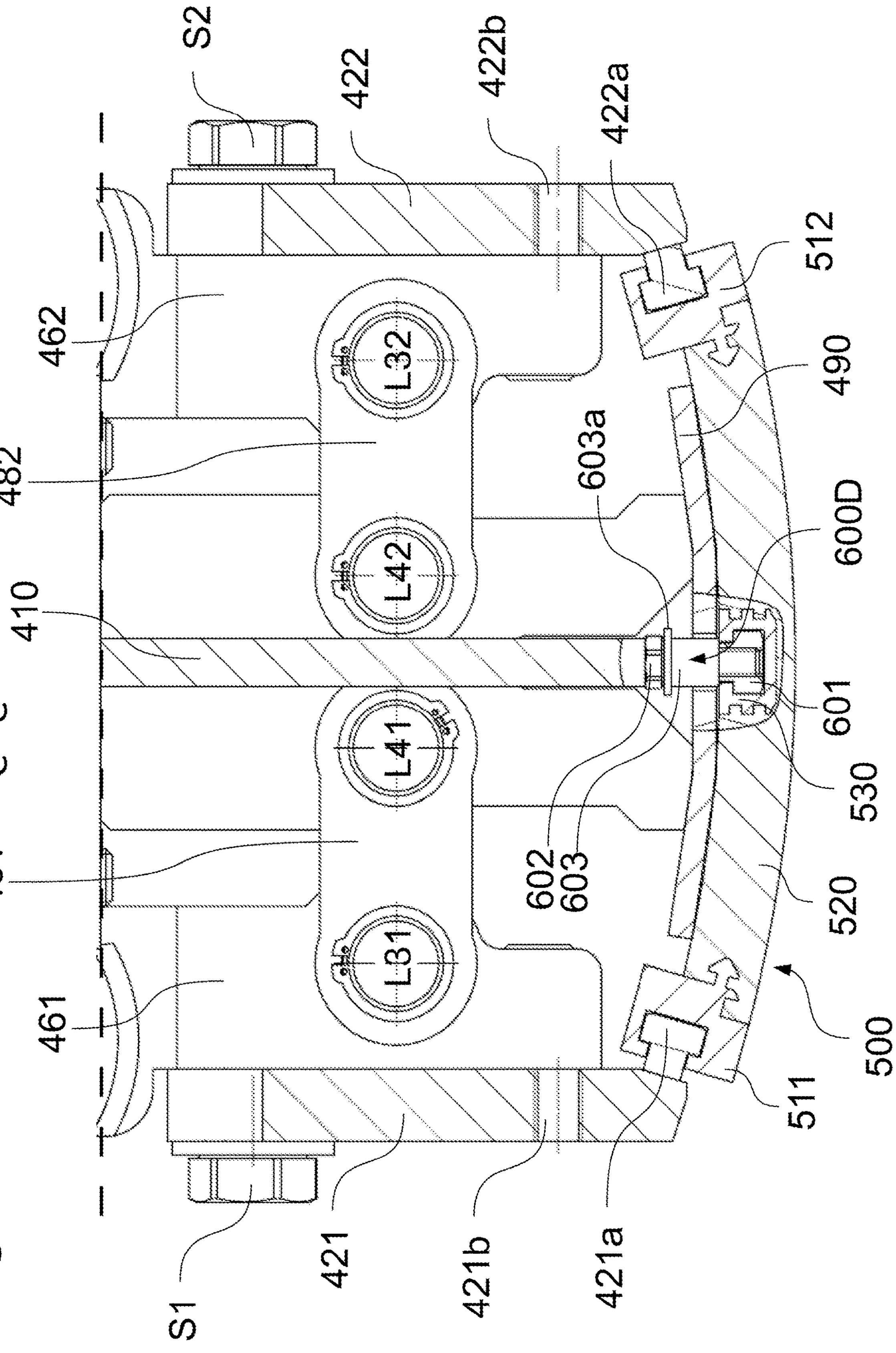
Fig. 10

Fig. 11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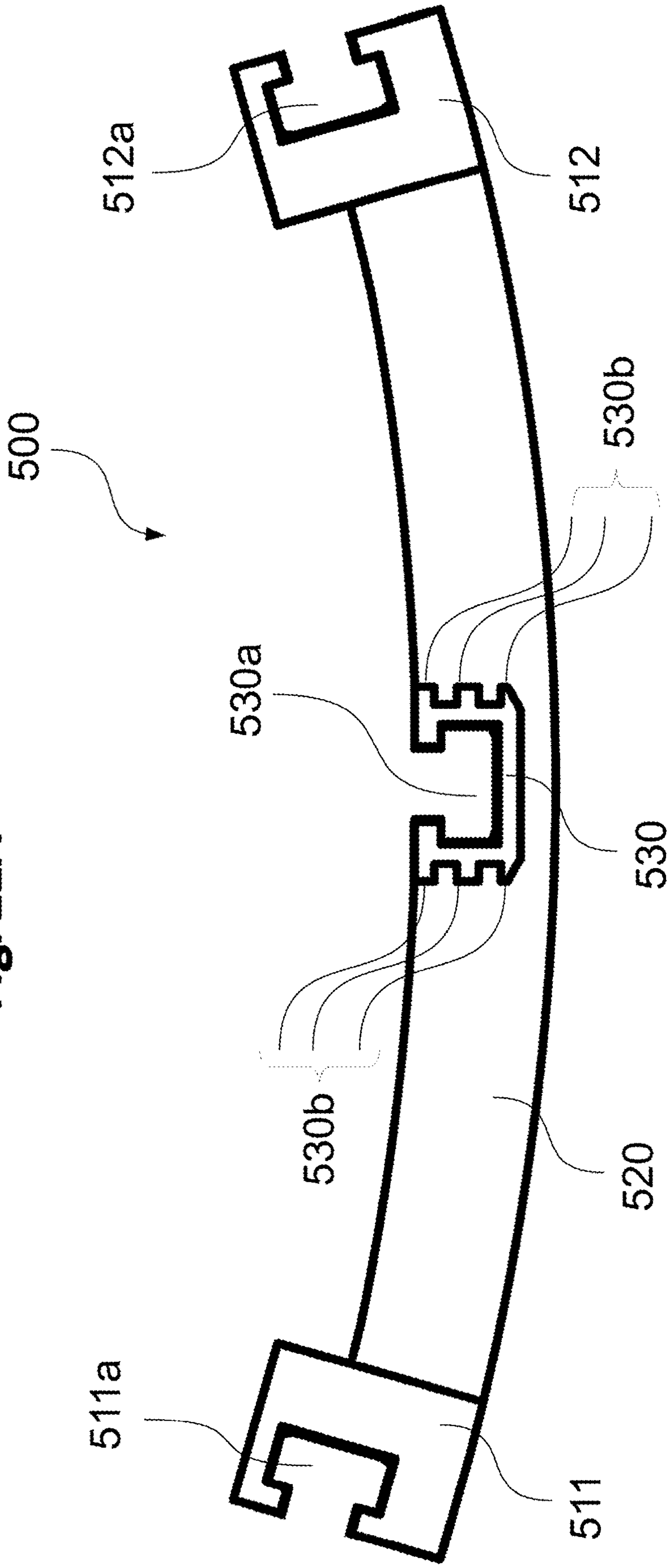


Fig. 12A

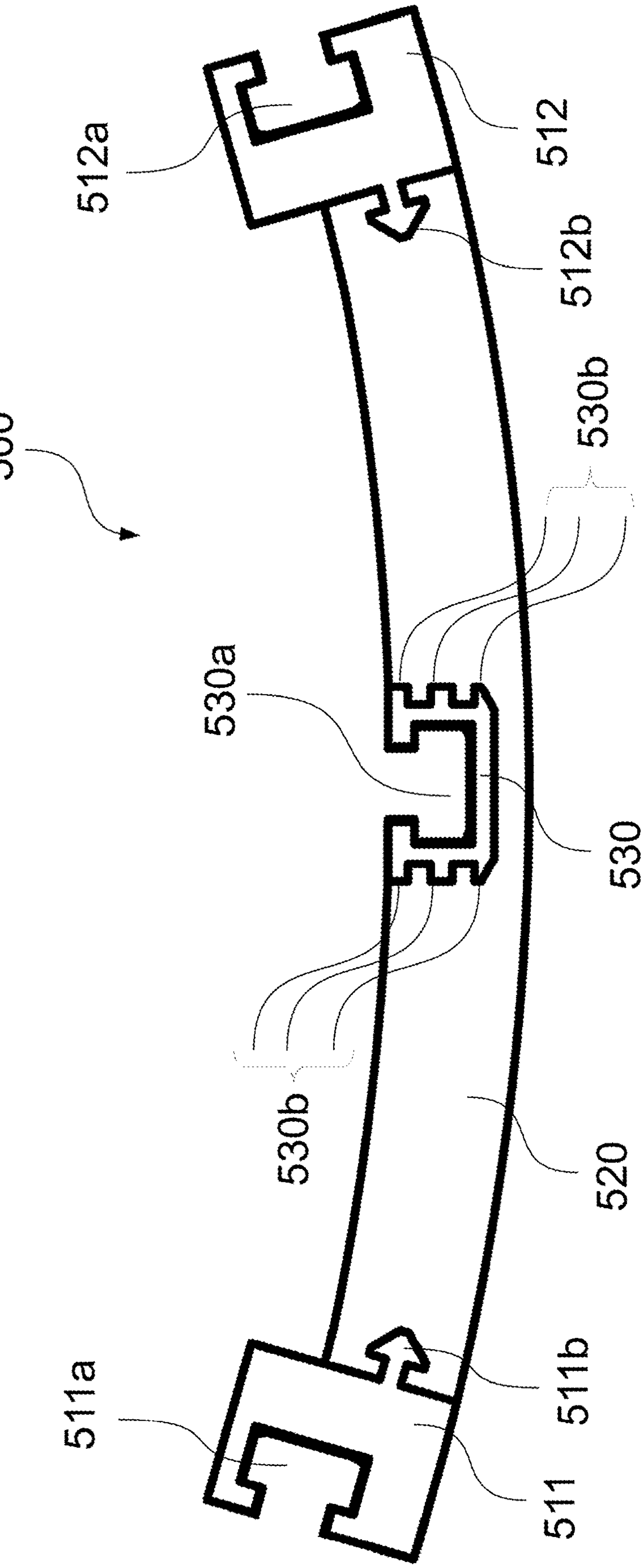


Fig. 12B

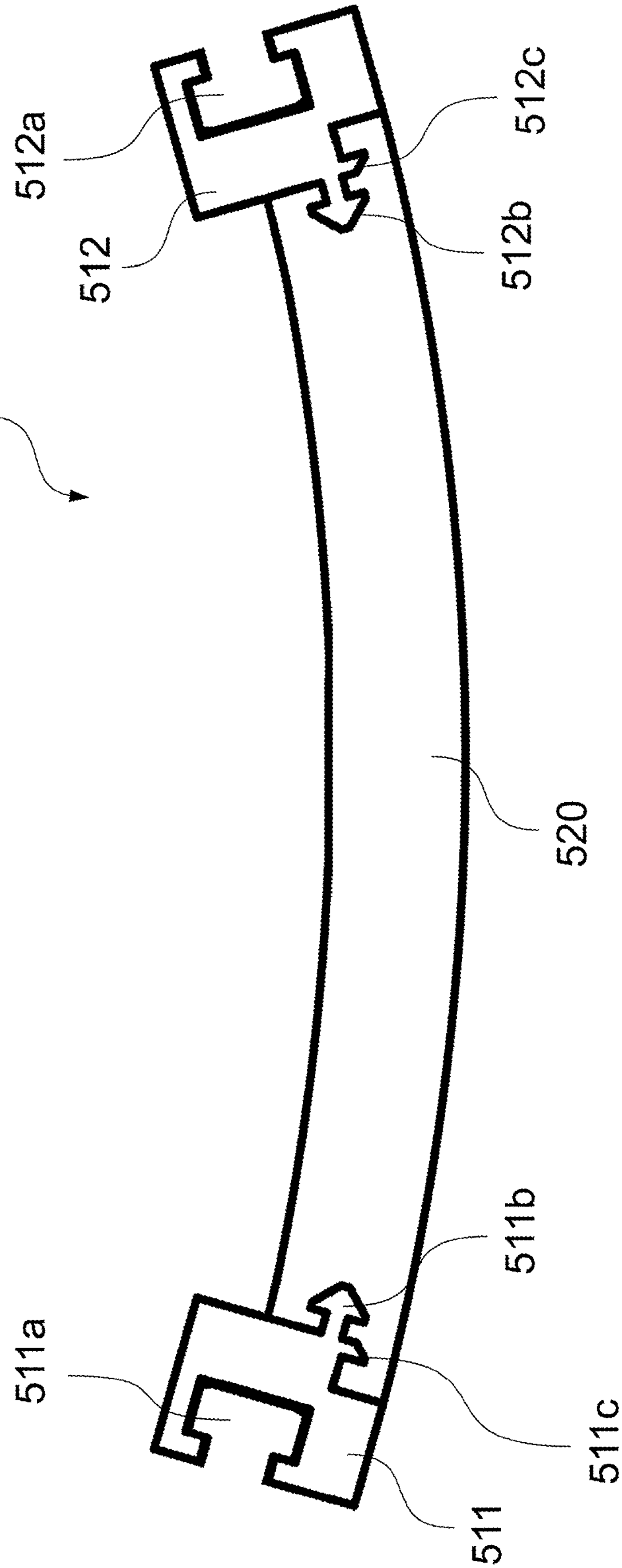
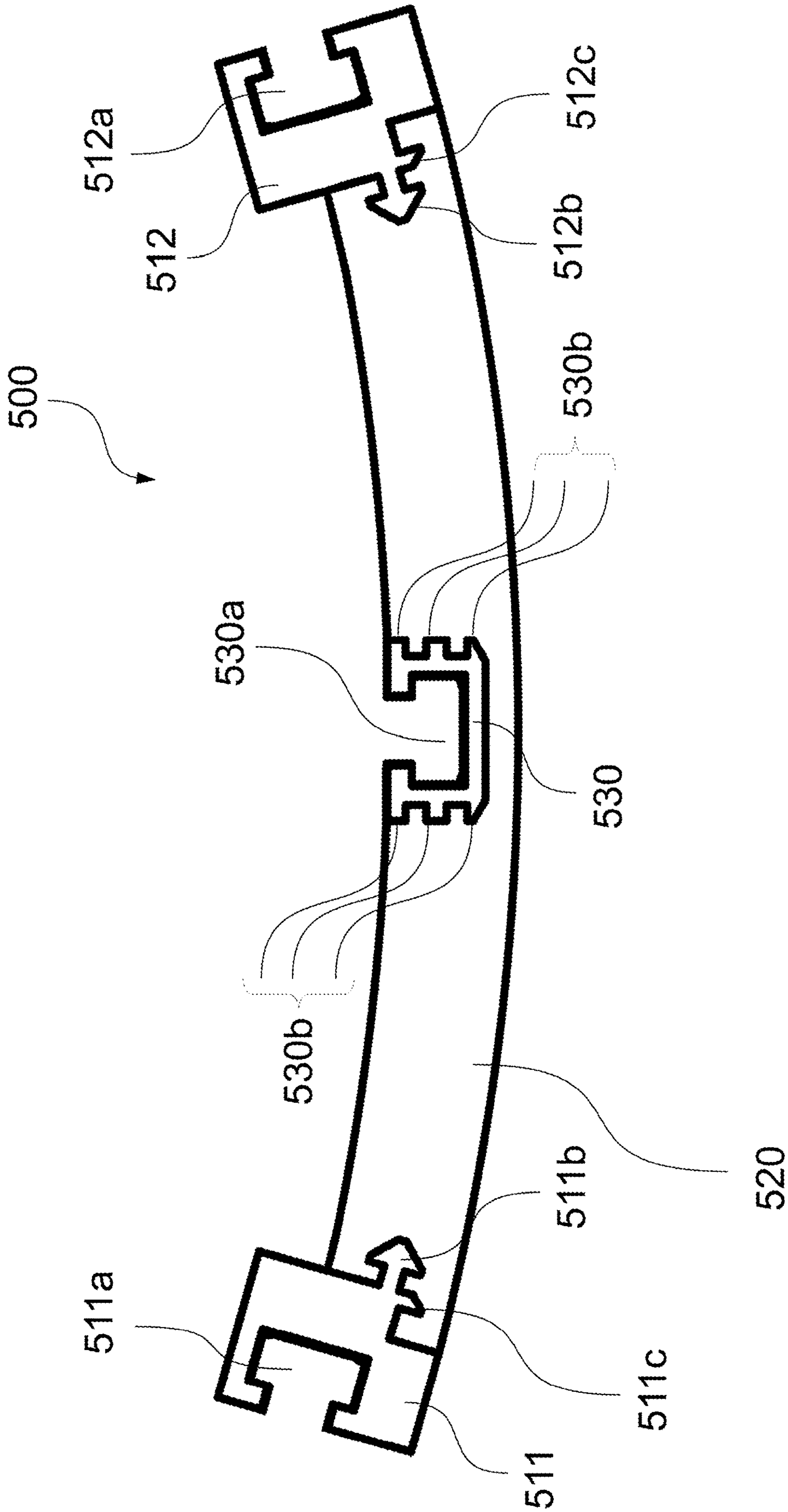


Fig. 12C

Fig. 12D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MOULD CORE FOR A MOULD FOR PRODUCING HOLLOW CONCRETE BODIES, AND A MOULDING DEVICE HAVING A MOULD CORE OF THIS KIND

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a US national stage application of International Application PCT/EP2021/058925, filed Apr. 6, 2021, the contents of which are incorporated by reference.

DESCRIPTION

The present disclosure relates to a mold core for a molding apparatus for producing hollow and/or in particular tubular concrete bodies and a molding apparatus having such a mold core for producing hollow and/or in particular tubular concrete bodies. Furthermore, the present disclosure relates to a sealing element, in particular a strip-shaped sealing element, and/or a longitudinal strip forming such a sealing element for use on such a mold core.

BACKGROUND

Mold cores for molding apparatuses for the production of hollow and/or tubular concrete bodies have been known in the prior art for a long time. For example, U.S. Pat. No. 1,394,570, published in 1921, shows a generic mold core for use as an inner mold for a molding apparatus for the production of hollow and/or in particular tubular concrete bodies. The mold core of U.S. Pat. No. 1,394,570 has a spreadable and/or expandable core which, in the expanded and/or expanded state, assumes the specified inner shape for the concrete casting process and is designed to be shrinkable and/or contractible for demolding the concrete body. Such expandable mold cores are also regularly referred to as collapsible cores in the prior art. Collapsible cores of this type facilitate demolding of a concrete body formed between an outer wall of the core of the molding apparatus and the collapsible core, in that the collapsible core can be shrunk from the spread set-up state assumed during the concrete pouring process and is thereby lifted off the inner wall of the concrete body.

Another generic mold core and/or collapsible core for use as an inner mold for a molding apparatus for producing hollow and/or in particular tubular concrete bodies is described in DE 10 2012 220 814 A1. The collapsible core according to DE 10 2012 220 814 A1 has an substantially cylindrical wall of the core (core mantle), which has an opening extending in the longitudinal direction on one side, on the opposite longitudinal edge sections of which a spreading device arranged inside the wall of the core engages in order to expand the opposite longitudinal edge sections of the wall of the core to spread the collapsible core apart in the tangential direction. In order to seal the opening, which extends in the longitudinal direction, towards the inside of the collapsible core, in particular when the collapsible core is in the expanded set-up state in which the concrete pouring process is carried out, according to DE 10 2012 220 814 A1, a connecting strip, which extends in the longitudinal direction, is provided between the opposite longitudinal edge sections and has at least one elastomeric portion, wherein the connecting strip is shear-resistant connected to the longitudinal edges of the wall of the core. This enables a permanent sealing connection of the two longitudinal edges of the wall of the core, both during the expansion process and during the shrinking process, so that the tightness of the wall of the core that is effective in all positions of the collapsible core can be ensured over the entire circumference. In the arrangement proposed in DE 10 2012 220 814 A1, a very good sealing of the interior of the collapsible core can be provided. However, during the expansion processes when setting up the collapsible core and/or the shrinking processes when removing the formwork from a concrete body, the elastomeric connecting strip is always exposed to alternating bending stresses, which leads to material fatigue that is disadvantageous for the service life, so that wear-related leaks can occur on the connecting strip and/or the connection to the longitudinal edges of the wall of the core can partially or completely tear off.

In view of the disadvantages described above, based on the prior art described above, it is an object of the present disclosure to provide a mold core for a molding apparatus for the production of hollow and/or in particular tubular concrete bodies and a molding apparatus having such a mold core for the production of hollow and/or in particular to provide tubular concrete bodies, in which a cost-effective arrangement can be provided that reliably seals the wall of the core inwards, which enables improved service live, is able to reduce material fatigue and/or wear and/or allows easier handling in the event of material fatigue and/or wear.

SUMMARY

The present disclosure relates to a mold core for a molding apparatus for producing hollow and/or in particular tubular concrete bodies and a molding apparatus having such a mold core for producing hollow and/or in particular tubular concrete bodies. Furthermore, a sealing element for use on such a mold core is proposed.

According to an exemplary aspect, a mold core is proposed for use on a molding apparatus for the production of hollow and/or in particular tubular concrete bodies, the mold core comprising: a longitudinally extending core mantle, which particularly preferably has a strip-shaped longitudinal opening extending in the longitudinal direction of the core mantle (preferably at least from one end to the other end of the core mantle) between two longitudinal edges of the core mantle, an expansion device for expanding and/or spreading and/or contracting and/or shrinking the mold core, and/or a sealing element sealing the longitudinal opening of the core mantle. The sealing element is preferably provided as a sealing element that deforms flexibly and/or elastically when the mold core contracts and/or shrinks and, in the shrunken or contracted state of the mold core, in particular by bending and in particular about a longitudinal axis, preferably folds inwards (or outwards), in particular relative to the core mantle.

According to particularly expedient examples, the sealing element can be connected to the core mantle so that it can be slidably displaced in the longitudinal direction, in particular, the sealing element can be connected to the two longitudinal edges of the core mantle so that it can be slidably displaced in the longitudinal direction. This has the advantage that the sealing element can be removed easily, efficiently and inexpensively due to the slidably displaceable connection in order to be replaced with another sealing element (spare part) if necessary, e.g. without having to remove the mold core from the molding apparatus.

According to particularly expedient examples, the sealing element can be attached to the respective longitudinal edges of the core mantle by a respective detachable connection. This has the advantage that the sealing element can be removed easily, efficiently and inexpensively due to the detachable connection in order to be replaced with another sealing element (spare part) if necessary, e.g. without having to remove the mold core from the molding apparatus. According to particularly expedient examples, the sealing element can be held in particular on the mold core so that it can be pulled out of the mold core in the longitudinal direction. In particular, the sealing element on the mold core can be pulled out of the longitudinal opening of the core mantle in the longitudinal direction and/or be held in a manner allowed to be pulled out from between the longitudinal edges of the core mantle, for example, in particular be pulled out in the longitudinal direction along the longitudinal edges of the core mantle. This has the advantage that the sealing element can be removed easily, efficiently and inexpensively by simply pulling it out in the longitudinal direction of the mold core in order to be replaced with another sealing element (spare part) if necessary, e.g. without having to remove the mold core from the molding apparatus.

According to particularly expedient examples, the sealing element can be connected with its longitudinal edges to the respective longitudinal edges of the core mantle (respectively) in a slidably displaceable manner in the longitudinal direction. In particular, respective longitudinal edges of the sealing element facing the longitudinal edges of the core mantle can each be connected to the respective longitudinal edges of the core mantle in a slidably displaceable manner in the longitudinal direction. This has the advantage that the sealing element can be removed easily, efficiently and inexpensively due to the slidably displaceable connection in order to be replaced with another sealing element (spare part) if necessary, e.g. without having to remove the mold core from the molding apparatus.

According to particularly expedient examples, the sealing element can be positively (form-fit positive lock) connected to (and/or with) the respective longitudinal edges of the core mantle in the direction transverse to the longitudinal direction of the mold core, particularly preferably in the substantially radial direction of the mold core and/or substantially perpendicular to the radial direction of the mold core relative to the mold core. Particularly preferably, the sealing element can be positively connected to (and/or with) the respective longitudinal edges of the core mantle in substantially all directions transverse to the longitudinal direction of the mold core, particularly preferably in the substantially radial direction of the mold core inwards and/or outwards and/or substantially in both directions perpendicular to the radial direction of the mold core relative to the mold core. This has the advantage that the sealing element can be held in such a way (preferably in a sealing manner) that substantially only the longitudinal direction remains as a translatory degree of freedom. According to particularly expedient examples, the sealing element can have lateral connecting strips which extend in the longitudinal direction and/or are fastened to the side and which can be held slidably displaceably in the longitudinal direction, preferably on the longitudinal edges of the core mantle, in particular on respective fastening strips fastened to the longitudinal edges of the core mantle.

According to particularly expedient examples, the connecting strips of the sealing element can have one or more profile groove sections extending in the longitudinal direction, in which preferably respective corresponding profile rail sections of the longitudinal edges, in particular of the fastening strips fastened to the longitudinal edges of the wall of the core, engage in a longitudinally slidably displaceable manner and/or are fitted in a longitudinally slidably displaceable manner. Alternatively or additionally, the connecting strips of the sealing element can have one or more profile rail sections extending in the longitudinal direction, which can preferably engage in the respective corresponding profile groove sections of the longitudinal edges, in particular the fastening strips fastened to the longitudinal edges of the wall of the core, in a longitudinally slidably displaceable manner and/or are fitted in a longitudinally slidably displaceable manner. According to particularly expedient examples, one or more profile groove sections and/or their corresponding one or more profile rail sections can have a T-shape in cross-sectional profile.

According to particularly expedient examples, the sealing element can have a flexible and/or elastically bendable connection band which, in particular, preferably can comprise an elastic plastic, in particular an elastomer. According to particularly expedient examples, the connecting band of the sealing element can be arranged between the connecting strips of the sealing element and/or can be connected to the connecting strips on both sides, respectively. According to particularly expedient examples, the connecting band of the sealing element can be attached to the connecting strips by a non-positive connection, particularly preferably by an adhesive connection. According to particularly expedient examples, the connecting strips of the sealing element can each have one or more retaining profile sections, in particular anchor and/or nose profile sections, protruding and/or engaging into the material of the connecting band in the cross-sectional profile. According to particularly expedient examples, at least one of the connecting strips of the sealing element can have, in the cross-sectional profile, a plurality of retaining profile sections which are aligned transversely to one another and/or project into and/or engage in the material of the connecting band.

According to a further exemplary aspect, a sealing element (e.g. also available as a spare part) for use on a mold core according to one of the above examples is proposed, with the sealing element or its lateral longitudinal edges (in particular facing the longitudinal edges of the wall of the core) preferably being configured to be connected to the longitudinal edges of the core mantle respectively in a slidably displaceable manner in the longitudinal direction, and particularly preferably to be fastenable to respective longitudinal edges of the core mantle by respective detachable connections.

According to particularly expedient examples, the sealing element or its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) can be configured to be connected to the core mantle in a longitudinally slidable displaceable manner, particularly preferably, the sealing element can be connected slidably displaceable in the longitudinal direction with respect to the two longitudinal edges of the core mantle.

According to particularly expedient examples, the sealing element or its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) can be designed to be attached to (and/or with) the respective longitudinal edges of the core mantle by respective detachable connections. According to particularly expedient examples, the sealing element or its lateral longitudinal edges (especially those facing the longitudinal edges of the core mantle) can be configured to be held in particular on the mold core so that it can be pulled out of the mold core in the longitudinal direction. In particular, the sealing element or its lateral longitudinal edges (in particular those facing the longitudinal edges of the core mantle) can be configured to be able to be pulled out of the longitudinal opening of the core mantle of the mold core in the longitudinal direction and/or to be held in a pull-out manner, for example, between the longitudinal edges of the core mantle, in particular to be held to be pulled out respectively at the respective longitudinal edges of the core mantle in the longitudinal direction.

According to particularly expedient examples, the sealing element can be configured with its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) or its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) can be configured to be slidably connected at (and/or with) the respective longitudinal edges of the core mantle in the longitudinal direction. In particular, respective longitudinal edges of the sealing element facing the longitudinal edges of the core mantle can each be configured to be slidably displaceably connected to/with the respective longitudinal edges of the core mantle in the longitudinal direction.

According to particularly expedient examples, the sealing element can be configured with its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) or its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) can be configured to be positively connected in a form-fitting manner at (and/or with) the respective longitudinal edges of the core mantle in the direction transverse to the longitudinal direction of the mold core, particularly preferably in the substantially radial direction of the mold core and/or substantially perpendicular to the radial direction of the mold core relative to the mold core. Particularly preferably, the sealing element can be configured with its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) or its lateral longitudinal edges (in particular facing the longitudinal edges of the core mantle) can be configured to be positively connected in a form-fitting manner at (and/or with) the respective longitudinal edges of the core mantle in substantially all directions transverse to the longitudinal direction of the mold core, particularly preferably in the substantially radial direction of the mold core inwards and/or outwards and/or substantially in both directions perpendicular to the radial direction of the mold core relative to the mold core. According to particularly expedient examples, the sealing element can have lateral longitudinally extending connecting strips (e.g. along the longitudinal edges of the sealing element and/or forming the longitudinal edges of the sealing element) and/or laterally fastened connecting strips which are preferably configured to attach to the longitudinal edges of the core mantle, in particular on respective fastening strips fastened to the longitudinal edges of the core mantle, in each case to be slidably held in the longitudinal direction.

According to particularly expedient examples, the connecting strips of the sealing element can have one or more profile groove sections extending in the longitudinal direction, in which preferably respective corresponding profile rail sections of the longitudinal edges of the core mantle, in particular of the fastening strips fastened to the longitudinal edges of the core mantle, can engage in a longitudinally slidably displaceable manner and/or are fitted in a longitudinally slidably displaceable manner. Alternatively or additionally, the connecting strips of the sealing element can have one or more profile rail sections extending in the longitudinal direction, which can preferably engage in the respective corresponding profile groove sections of the longitudinal edges of the core mantle, in particular the fastening strips fastened to the longitudinal edges of the core mantle, in a longitudinally slidably displaceable manner and/or are fitted in a longitudinally slidably displaceable manner. According to particularly expedient examples, one or more profile groove sections and/or their corresponding one or more profile rail sections can have a T-shape in cross-sectional profile.

According to particularly expedient examples, the sealing element can have a flexible and/or elastically bendable connecting band which, in particular, preferably can comprise an elastic plastic, in particular an elastomer. According to particularly expedient examples, the connecting band of the sealing element can be arranged between the connecting strips of the sealing element and/or can be connected to the connecting strips on both sides. According to particularly expedient examples, the connecting band of the sealing element can be attached to the connecting strips by a non-positive connection, particularly preferably by an adhesive connection. According to particularly expedient examples, the connecting strips of the sealing element can each have one or more retaining profile sections, in particular anchor and/or nose profile sections, protruding and/or engaging into the material of the connecting band in the cross-sectional profile. According to particularly expedient examples, at least one of the connecting strips of the sealing element can have, in the cross-sectional profile, a plurality of retaining profile sections which are aligned transversely to one another and/or project into and/or engage in the material of the connecting band.

According to a further exemplary aspect, a molding apparatus for the production of hollow and/or in particular tubular concrete bodies is also proposed, comprising an outer mold and an inner mold which is preferably arranged and/or can be arranged in the outer mold and which preferably has a mold core according to one of the above aspects and/or examples.

Further preferred examples of the mold core and/or sealing element are described below, which can be combined with the above aspects and expedient examples.

The sealing element is preferably provided as a sealing element that deforms flexibly and/or elastically when the mold core contracts and/or shrinks and, in the shrunken or contracted state of the mold core, preferably folds inwards (or outwards), in particular relative to the core mantle, in particular by bending, in particular about a longitudinal axis.

According to particularly expedient examples, one or more guide elements can be arranged on the side of the sealing element facing the interior of the mold core. According to particularly expedient examples, the expansion device can be configured to bring the mold core from the expanded or spread state into the contracted or shrunken state in at least two successive shrinking processes. In particular, the expansion device can preferably be configured to bring the mold core from the expanded or spread state into the contracted or shrunk state in at least two consecutive shrinking processes in that at least one driver section of the expansion device comes into contact with at least one entrainment section of the one or more guide elements of the sealing element in the transition from a first shrinking process of the at least two consecutive performed shrinking processes to a second shrinking process of the at least two successively performed shrinking processes, in particular for guiding the sealing element in (or during) the second shrinking process (and possibly in or during further shrinking processes). The formulation of the two or more shrinking processes means in particular that the expansion device already partially shrinks or contracts the mold core in a first shrinking process and in at least one further shrinking process further shrinks or contracts the mold core from the partially shrunken or partially contracted state in order to bring the mold core in the last of the at least two shrinkage processes into the contracted or shrunken state. This does not rule out that the shrinking processes can continuously merge into one another, with the transition from the first to at least one further second shrinking process being recognizable in that, after partial shrinkage or contraction of the mold core has already taken place, at least one driver section of the expansion device comes into contact with at least one entrainment section of the one or more guide elements of the sealing element in the transition from the first to the second shrinking process. In particular, this means that the at least one driver section of the expansion device is not yet in contact or nor does it come into contact with the at least one driver section of the one or more guide elements in the first shrinking process, but only after the shrinkage or contraction of the mold core has already partially taken place. This has the advantage that no tensile forces are exerted on the sealing element in the first shrinking process, but the sealing element can be advantageously guided in the subsequent second shrinking process. This prevents excessive wear of the sealing element due to the avoidance of tensile forces acting on the sealing element.

According to particularly expedient examples, the expansion device can also be configured to engage, in the transition from the first to the second shrinking process, on/with the one or more guide elements and/or to come into contact or driving contact element with the one or more guide elements, and to guide the sealing element in the second shrinking process, in particular with engagement and/or contact on the one or more guide members. This has the advantage that no tensile forces are exerted on the sealing element in the first shrinking process, but the sealing element can be advantageously guided in the subsequent second shrinking process. This prevents excessive wear of the sealing element due to the avoidance of tensile forces acting on the sealing element.

According to particularly expedient examples, one or more guide elements of the sealing element can each have a spacer sleeve, in particular a respective spacer sleeve with one of the at least one entrainment sections, with the respective entrainment section of the spacer sleeve preferably being spaced from the side of the sealing element facing the interior of the mold core. According to particularly expedient examples, the at least one driver section of the expansion device can preferably be moved inward relative to the mold core during contraction or shrinkage of the mold core and/or preferably come into contact with the at least one driver section of the respective spacer sleeve of the guide elements in the transition from the first to the second shrinking process, and/or the at least one driver section of the expansion device can preferably guide and/or take along (pull) the one or more guide elements of the sealing element in the second shrinking process. This has the advantage that no tensile forces are exerted on the sealing element in the first shrinking process, but the sealing element can be advantageously guided in the subsequent second shrinking process. This prevents excessive wear of the sealing element due to the avoidance of tensile forces acting on the sealing element.

According to particularly expedient examples, the expansion device can comprise a shaped element which, in the expanded or spread state of the mold core, bears against the side of the sealing element facing the interior of the mold core and/or is moved inward relative to the mold core when the mold core contracts or shrinks. According to particularly expedient examples, the shaped element can have the at least one driver section of the expansion device. According to particularly expedient examples, the shaped element can be a shaped sheet metal extending in the longitudinal direction of the mold core, and the at least one driver section of the expansion device can be formed by a respective borehole in the shaped sheet metal, through which the respective spacer sleeve of the guide element or of the one or more guide elements can extend. According to particularly expedient examples, the at least one entrainment section of the respective spacer sleeve of the guide element or of the one or more guide elements can be arranged on the side of the shaped sheet metal facing away from the sealing element. According to particularly expedient examples, the entrainment section of the respective spacer sleeve of the guide element or of the one or more guide elements can be at a distance from the side of the sealing element facing the interior of the mold core, which distance is preferably greater than the sheet metal thickness of the shaped sheet. According to particularly expedient examples, one or more guide elements can each have a stamping section on the side facing the sealing element, which preferably engages and/or is fitted into a groove section of the sealing element, the groove section of the sealing element particularly preferably having substantially a T-shape in cross-sectional profile. According to particularly expedient examples, the stamping section can engage and/or be fitted in a direction transverse to the longitudinal direction of the mold core in a positively connected manner in the groove section of the sealing element, particularly preferably in the radial direction of the mold core and/or substantially perpendicular to the radial direction of the mold core. According to particularly expedient examples, the stamping section of the respective guide element can engage in the groove section of the sealing element in a slidably displaceable manner in the longitudinal direction of the mold core. According to particularly expedient examples, the sealing element can have a connecting band on which a guide strip which has the groove section and extends in the longitudinal direction of the mold core is preferably arranged.

According to a further exemplary aspect, a sealing element (e.g. also available as a spare part) for use on a mold core according to one of the above examples is proposed, with the sealing element preferably being able to be fastened to the respective longitudinal edges of the longitudinal opening of the core mantle by a detachable connection. Furthermore, one or more guide elements can be arranged on the side of the sealing element that faces the interior of the mold core (in the fastened state). According to particularly expedient examples, the sealing element or the one or more guide elements can be configured and/or designed in such a way that at least one driver section of the expansion device comes or can come into contact with at least one entrainment section of the one or more guide elements of the sealing element (in the fastened state) in the transition from a first shrinking process of the at least two shrinking processes carried out in succession to a second shrinking process of the at least two in succession performed shrinking processes, in particular for guiding the sealing element in (or during) the second shrinking process (and possibly in or during further shrinking processes). The sealing element preferably has a connecting band on which a guide strip, which has the groove section and extends in the longitudinal direction of the mold core, is preferably arranged. Further examples of the sealing element are described above and/or below.

According to a further exemplary aspect, a molding apparatus for the production of hollow and/or in particular tubular concrete bodies is also proposed, comprising an outer mold and an inner mold which is preferably arranged and/or can be arranged in the outer mold and which preferably has a mold core according to one of the above aspects and/or examples.

Further aspects and their advantages, as well as advantages and more specific implementation options of the aspects and features described above, are described in the following descriptions and explanations relating to the attached figures, but these are in no way to be understood as limiting.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** shows an exemplary perspective view of a molding apparatus for producing tubular concrete bodies according to an exemplary embodiment of the present disclosure;

FIG. **2** shows an exemplary plan view of the exemplary molding apparatus of FIG. **1**;

FIG. **3** shows an exemplary cross-sectional view of the exemplary molding apparatus of FIG. **1** (section A-A of FIG. **2**);

FIG. **4** shows an exemplary perspective view of a mold core of a molding apparatus for the production of tubular concrete bodies according to an exemplary embodiment of the present disclosure;

FIG. **5** shows an exemplary plan view of the exemplary mold core of FIG. **4**;

FIG. **6** shows an exemplary longitudinal sectional view of the exemplary mold core according to FIG. **3** (section B-B according to FIG. **5**);

FIG. **7** shows an exemplary perspective view of an exemplary expansion device of a mold core of a molding apparatus for manufacturing tubular concrete bodies according to an exemplary embodiment of the present disclosure;

FIG. **8** shows an example front view of the example expansion device of FIG. **7**;

FIG. **9** shows an exemplary top view of the exemplary expansion device according to FIG. **7**;

FIG. **10** shows an exemplary longitudinal side view of the exemplary expansion device of FIG. **7**;

FIG. **11** shows an exemplary cross-sectional view of the exemplary expansion device of FIG. **7** (section C-C of FIG. **10**);

FIG. **12**A shows an exemplary profile view of a sealing element for use on a mold core according to an exemplary embodiment of the present disclosure;

FIG. **12**B shows an exemplary profile view of a sealing element for use on a mold core according to another exemplary embodiment of the present disclosure;

FIG. **12**C shows an exemplary profile view of a sealing element for use on a mold core according to another exemplary embodiment of the present disclosure; and

FIG. **12**D shows an exemplary profile view of a sealing member for use on a mold core according to another exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE FIGURES AND PREFERRED EXAMPLES

Preferred examples and/or examples of the present disclosure are described in detail below with reference to the attached figures. Identical and/or similar elements in the figures can be denoted by the same reference numbers, but sometimes also by different reference numbers. It should be emphasized that the present disclosure is in no way limited and/or restricted to the examples described below and their design features, but also includes modifications of the examples, in particular those that are obtained by modifications of the features of the examples described and/or by combination of one or more of the features of the examples described are included within the scope of the independent claims.

FIG. **1** shows an exemplary perspective view of a molding apparatus **1000** for producing tubular concrete bodies according to an exemplary embodiment of the present disclosure. FIG. **2** shows an example top view of the example molding apparatus **1000** of FIG. **1**. FIG. **3** shows an example cross-sectional view of the example molding apparatus **1000** of FIG. **1** (section A-A of FIG. **2**). For example, the molding apparatus **1000** is herein configured to produce cylindrical concrete pipes that have a substantially circular cross section with a wall thickness that is substantially constant over the circumference (i.e., for example, with substantially coaxial circular inner and outer cross-sectional shapes). However, further exemplary embodiments with other inner and/or outer shapes can be provided, in which hollow and/or tubular concrete bodies can be produced, the outer and/or inner shape of which deviates from the circular shape in cross-section, e.g. with oval, elliptical, angular (possibly with rounded corners) cross-sectional shapes outside and/or inside and/or with inside and/or outside shape centers deviating from the coaxial arrangement.

The molding apparatus **1000** of the exemplary embodiment according to FIGS. **1**, **2** and **3** comprises, by way of example, a stand section **100** on which an outer mold **200** comprising two outer mold sections **210** and **220** is arranged. In this case, both outer mold sections **210** and **220** are formed, purely by way of example, substantially as semi-hollow cylindrical elements which, when put together, form the outer mold **200**, which is in the form of a hollow cylinder, for example. In further examples, the outer mold can be composed of two or more identical and/or differently shaped outer mold sections. The outer mold sections **210** and **220** of the outer mold **200** of the example according to FIGS. **1** and **2** are arranged on respective carriage sections **211** and **221**, for example. By means of the carriage sections **211** and **221**, which are slidably displaceably mounted on rails **110** and **120**, which are arranged, for example, on the stand section **100**, the outer mold sections **210** and **220** can be moved apart and/or away from each other, for example, for demoulding a concrete body B produced in the molding apparatus **1000** from the set-up state shown in FIG. **1** to be moved to release the concrete body inside. In the set-up process, e.g. before the next concrete pouring process, the outer mold sections **210** and **220** can be moved towards one another and/or brought together again in order to be assembled and/or fastened to one another in the set-up state shown as an example in FIG. **1**. In the set-up state, the inner wall of the outer mold sections **210** and **220** forms, for example, substantially a cylinder shape (hollow cylinder inner wall), which at least partially forms the outer wall of the concrete body to be produced.

The molding apparatus **1000** of the embodiment according to FIGS. **1**, **2** and **3** further includes a mold core **300** forming the inner mold. The mold core **300** and/or its outer shape substantially forms a (vertical) cylindrical shape, which at least partially forms the inner wall of the concrete body B to be produced. During the concrete pouring process, in the set-up state of the molding apparatus **1000** according to FIG. **1**, concrete can be poured into the gap formed between the outer mold **200** and the mold core **300** in order to form the concrete body B to be produced (see, for example, FIGS. **2** and **3**). By way of example, the molding apparatus **1000** is used to form substantially cylindrical concrete pipes in an upright position. The mold core **300** of the molding apparatus **1000** is exemplary embodied as a collapsible core, for example, which has an expansion device **400** (spreading and/or shrinking device) arranged in the exemplary hollow-cylindrical interior of the mold core **300** (see FIG. **2**, not shown in FIGS. **1** and **3**). The expansion device **400** extends, for example, in the interior of the mold core **300**, in particular, for example, in the longitudinal direction of the mold core **300**, i.e. in the present example vertically in the case of the mold core **300** standing as an example in FIG. **1**. The longitudinal direction of the mold core is defined here, for example, by the longitudinal direction of the hollow and/or tubular concrete bodies or concrete pipes to be produced. The expansion device **400** is configured, for example, to spread (expand) the mold core **300** to form the set-up state for the concrete casting process and/or to shrink (contract) the mold core **300** to demould the concrete body B.

However, it should be pointed out that in the present example, substantially cylindrical concrete pipes can be cast in an upright position only by way of example. However, further examples are possible in which the outer shape and/or the inner shape, i.e. e.g. the inner mold core, of the molding apparatus deviate from the cylindrical shape and/or the substantially circular cross-section. For example, it is possible to produce concrete pipes with an oval cross-section or a square (triangular, square, pentagonal and with more corners) cross-section, if necessary with rounded corners, in which case the outer shape and/or the mold core in cross-section can be adapted to the desired shape of the produced concrete body is adjusted. Thus, examples with mold cores with an oval cross section or angular cross section, possibly with rounded corners, are also possible. Consequently, further examples with other inner and/or outer shapes can be provided, in which hollow and/or tubular concrete bodies can be produced, the outer and/or inner shape of which deviates from the circular shape in cross section, e.g. with oval, elliptical, angular (possibly with rounded corners) cross-sectional shapes outside and/or inside and/or with inside and/or outside shape centers deviating from the coaxial arrangement. Here, the cross-sectional shape of the inner wall of the outer mold and/or the cross-sectional shape of the outer wall of the mold core or the inner shape can deviate from the circular shape. Furthermore, it is possible to provide external and/or internal shapes whose cross-sectional shape and/or cross-sectional size may change in the longitudinal direction. In further examples, the outer mold **200** can, for example, comprise a cover element, possibly a circular and/or ring-shaped cover element, which covers the concrete body B hardening in the mold after the casting process from above, and/or a clamping device, which fastens the outer mold **200** and the inner mold and/or the mold core **300** in the set-up state for the casting process. In this example, the expansion device **400** is controlled hydraulically, for example, and/or can be actuated hydraulically, whereby in further examples, in addition to one or more hydraulic mechanisms, other mechanisms can also be used additionally or alternatively, e.g. using a mechanical, hydraulic, pneumatic and/or electrical and/or or electromagnetic control.

FIG. **4** shows an exemplary perspective view of a mold core **300** of a molding apparatus **1000** for producing hollow and/or in particular tubular concrete bodies according to an example of the present disclosure. By way of example, the mold core **300** in the molding apparatus **1000** according to FIGS. **1** to **3** can be used. Analogously to FIG. **2**, the mold core **300** has the expansion device **400** on the inside, for example. The mold core **300** comprises, for example, a substantially cylindrical core mantle **310** (can also be referred to as a form mantle or wall of the core), which has a strip-shaped opening (longitudinal opening) that extends, for example, on one side in the longitudinal direction of the mold core **300**, from one end to the other end of the mold core **300** and/or over the entire length of the mold core, on which opening, for example, a sealing and/or closing strip-shaped sealing element **500** is arranged. By way of example, the strip-shaped sealing element **500** extends (preferably at least) substantially from one end to the other end of the mold core **300**, in particular in the longitudinal direction of the mold core, and/or by way of example (preferably at least) over the entire length of the mold core **300** along the longitudinal opening of the core mantle **310**, especially in the longitudinal direction of the mold core. The strip-shaped sealing element **500** has on its longitudinal edges, for example, connecting strips **511** and **512** extending in the longitudinal direction, which connect the sealing element **500** to the respective longitudinal edges **311** and **312** of the strip-shaped longitudinal opening of the core mantle **310** and/or attach them sealingly. For example, FIG. **4** shows the mold core **300** in the spreaded and/or expanded state, in which the core mantle **310** is expanded, for example in such a way that the longitudinal edges **311** and **312** of the strip-shaped longitudinal opening of the core mantle **310** are pushed apart, in particular controlled and/or driven by, for example the expansion device **400**. In FIG. **4**, fastening elements **321** to **324** on the underside of the mold core **300** are shown merely by way of example, with which the mold core **300** can be fastened in a standing position on and/or at the stand section **100** of the molding apparatus **1000** between the outer mold sections **210** and **220** of the outer mold **200**.

FIG. **5** shows an exemplary plan view of the example of the mold core **300** according to FIG. **4**. Here, in particular, the exemplary expansion device **400** arranged inside the mold core **300** is shown (e.g. analogously to FIG. **2**). The expansion device **400** is operated hydraulically, for example, and is configured, for example, to spread and/or expand the mold core **300**, e.g. by the longitudinal edges **311** and **312** of the core mantle **310** being pushed apart by an expansion mechanism of the expansion device **400**, for example hydraulically controlled, or by expansion of the core mantle **310**. Conversely, the expansion device **400** is configured, for example, to shrink and/or contract the mold core **300** in that the longitudinal edges **311** and **312** are moved towards one another and/or towards onto one another by the expansion mechanism of the expansion device **400**, for example hydraulically controlled, or by contracting the core mantle **310**. FIG. **5** shows, by way of example, the expanded and/or spread state of the mold core **300**, with the longitudinal edges **312** and **312** of the strip-shaped longitudinal opening of the core mantle **310** being pushed apart, for example. The sealing element **500** is arranged between the longitudinal edges **311** and **312** of the longitudinal opening of the core mantle **310**, for example, wherein the sealing element **500** seals the mold core **300** from the outside against the ingress of liquid, and, on the longitudinal sides of the sealing element **500**, the connecting strips **511** and **512**, for example, connect the sealing element **500** with the respective longitudinal edges **311** and **312** of the longitudinal opening of the core mantle **310** in a sealed manner. An exemplary expansion mechanism of the expansion device **400** and its exemplary mode of operation according to an example is shown in FIGS. **6** to **11** in more detail.

FIG. **6** shows an exemplary longitudinal cross-sectional view of the exemplary mold core **300** of FIG. **3** (section B-B of FIG. **5**). FIG. **6** shows, by way of example, the expansion device **400** inside the mold core **300**, the expansion device **400** extending, by way of example, in the longitudinal direction from one end of the mold core **300** to the other end. By way of example, the expansion device **400** comprises two hydraulically actuated expansion mechanisms **400**A and **400**B of exemplarily identical construction at different positions inside the mold core **300**. In further examples, only one or more than two expansion mechanisms can also be provided, e.g. also depending on the length of the mold core. The expansion mechanisms **400**A and **400**B are each configured, for example, to move the sword element **410** of the expansion device **400**, which extends for example in the longitudinal direction, in the radial direction of the substantially cylindrical core mantle **310**, for example. The further exemplary mode of operation of the expansion device **400** and/or expansion mechanisms **400**A and **400**B is described in the following purely by way of example using an example.

FIG. **7** shows an exemplary perspective view of an exemplary expansion device **400** of a mold core **300** of a molding apparatus **1000** for the production of hollow and/or in particular tubular concrete bodies according to an embodiment of the present disclosure. As previously described, by way of example, expansion device **400** includes two hydraulically actuable expansion mechanisms **400**A and **400**B. In further examples, only one or more than two expansion mechanisms can also be provided, e.g. also depending on the length of the mold core.

FIG. **8** shows an exemplary front view of the exemplary expansion device **400** according to FIG. **7**, in particular, for example, in the spreaded and/or expanded state. FIG. **9** shows an exemplary top view of the exemplary expansion device **400** according to FIG. **7**. FIG. **10** shows an exemplary longitudinal side view of the exemplary expansion device **400** according to FIG. **7**. The expansion device **400** comprises, by way of example, two fastening strips **421** and **422** which extend parallel to one another in the longitudinal direction and which, for example, can be fastened and/or are fastened to the parallel extending longitudinal edges **311** and **312** of the strip-shaped longitudinal opening of the core mantle **310** in a parallel arrangement (see e.g. FIGS. **4** and **5**). The expansion mechanisms **400**A and **400**B are each fastened and/or screw-connected to the fastening strips **421** and **422** on both sides in the longitudinal direction one behind the other, for example, via respective screw connections S**1** and S**2**. The fastening strips **421** and **422** serve in the example only as an example as fasteners for fastening the expansion device **400** to the core mantle **310** or to the longitudinal edges **311** and **312** of the core mantle **310** and also only as an example for fastening or connecting the sealing element **500** or the connecting strips **511** and **512** of the sealing element **500** at/with the longitudinal edges **311** and **312** of the strip-shaped longitudinal opening of the core mantle **310** (see e.g. FIG. **5**).

The expansion mechanism of expansion device **400** shown in FIG. **8** (and analogously, by way of example, expansion mechanisms **400**A and **400**B of exemplary identical construction) includes, for example, a hydraulic cylinder **430**, the hydraulically controllable piston **431** of which, for example, has a lever element **440** that extends transversely to piston **431** and transversely to the longitudinal direction of expansion device **400** and is connected, in particular, for example, via a screw connection S**3**. On the side of hydraulic cylinder **430** facing away from lever element **440**, the hydraulic cylinder **430** and/or a carrier element **470** carrying the hydraulic cylinder **430** is connected, for example, to the sword element **410** extending transversely to the axis of the hydraulic cylinder **430**. At both end sections **441** and **442** of the lever element **440** and/or at both opposite sides of the lifting element **440**, the push rod elements **451** and **452** are fastened, for example. For example, the push rod elements **451** and **452** are connected at both ends via swivel joints L**11** and L**12** and they can be rotatably mounted and/or pivotally mounted and/or rotatably held at the swivel joints L**11** and L**12** about a respective axis of rotation that is aligned substantially perpendicular to the push rod elements **451** and **451** and/or parallel to the longitudinal direction of the expansion device **400**. The push rod elements **451** and **452** extend, for example, parallel to one another and parallel to the piston **431** of the hydraulic cylinder **430** and/or parallel to the axis of the hydraulic cylinder **430**, which is aligned transversely to the longitudinal direction of the expansion device **400**. For example, the push rod elements **451** and **452** are connected to the ends facing away from the lever element **440** and/or on the side facing away from the lever element **440** to respective fastening sections **461** and **462**, wherein the fastening sections **461** and **462** are exemplarily respectively connected to the fastening strips **421** and **422** and/or or are fastened to them oppositely via the screw connections S**1** and S**2**. Furthermore, by way of example, respective spacer elements **481** and **482** are fastened to the fastening sections **461** and **462** via pivot joints L**31** and L**32**, the respective other ends of the spacer elements **481** and **482** being fastened to the sword element **410** on transversely opposite sides of the sword element **410** via respective pivot joints L**41** and L**42** to the sword element **410**. For example, the spacer elements **481** and **482** are each mounted on the pivot joints L**31**, L**32**, L**41** and L**42** such that they can rotate and/or pivot and/or about a respective axis of rotation that is substantially perpendicular to the push rod elements **451** and **452** and/or parallel to the longitudinal direction of the expansion device **400**. The spacer elements **481** and **482** are, for example, always aligned with their own longitudinal direction transverse to the longitudinal direction of the expansion device **400**. It should be mentioned at this point that the longitudinal direction of the expansion device **400** in FIG. **8** is arranged, for example, perpendicular to the plane of the drawing. Here, the spacer elements **481** and **482** can be pivoted with respect to one another due to the rotatable mounting on the joints L**31**, L**32**, L**41** and L**42** and can also be pivoted relative to the connecting rods **451** and **452** at the same time.

In the exemplary spreaded position of expansion device **400** (spreaded and/or expanded state) shown in FIG. **8**, the spacer elements **481** and **482** are, for example, aligned with their own longitudinal direction parallel and/or axially to one another and, for example, transversely to the push rods **451** and **452**. Due to the alignment axially to one another, the joints L**31** to L**41** and/or L**32** to L**42** (and thus the joints L**31** to L**32**) on both sides of the expansion mechanism **400** are at a maximum distance from one another. Thus, the opposing fastening sections **461** and **462** in the state shown in FIG. **7** are, for example, at a maximum distance from one another and the fastening strips **421** and **422** (and thus also the longitudinal edges **311** and **312** of the core mantle **310** fastened to them) are pushed apart at a maximum distance. This leads to the core mantle **310** being spreaded and/or expanded. In order to shrink and/or contract the mold core **300**, e.g. for the demolding process, the hydraulic cylinder **430** can be actuated to retract the piston **431** so that the sword element **410** is moved towards the lever element **440**, i.e. in particular in the inward direction relative to the mold core **300**. This also leads to a movement of the sword element **410** relative to the fastening sections **461** and **462** and/or the fastening strips **421** and **422**, so that the spacer elements **481** and **482** can be pivoted against each other and relative to the fastening sections **461** and **462** and the sword element **410**. Due to the pivoting of the spacer elements **481** and **482**, the distance between the attachment sections **461** and **462** is reduced compared to the spreaded position shown in FIG. **8**, so that the attachment strips **421** and **422** connected to the attachment sections **461** and **462** and/or the longitudinal edges **311** and **312** attached thereto of the core mantle **310** are contracted and the distance between the longitudinal edges **311** and **312** of the core mantle **310** is reduced over the entire length of the core mantle **310**. This leads to the desired shrinkage of the mold core **300** in order to facilitate demoulding of the concrete body B.

FIG. **8** also shows the fastening of the exemplary sealing element **500** by way of example. The sealing element **500** is fastened to the respective fastening strips **421** and **422** by connection of the connecting strips **511** and **512** of the sealing element **500** and/or is connected to them in a sealing manner. The fastening strips **421** and **422** serve in the example only as an example as fasteners for fastening the expansion device **400** to the core mantle **310** or to the longitudinal edges **311** and **312** of the core mantle **310** and also only as an example for fastening or connecting the sealing element **500** or the connecting strips **511** and **512** of the sealing element **500** at/with the longitudinal edges **311** and **312** of the strip-shaped longitudinal opening of the core mantle **310** (see e.g. FIG. **5**). In particular, the profiles of the connecting strips **511** and **512** of the sealing element **500** have, for example, longitudinally running groove sections **511***a* and **512***a* which, for example, have a T-shape in cross-sectional profile (see e.g. also FIGS. **12**A to **12**D). The fastening strips **421** and **422** have, for example, corresponding profile rails **421***a* and **422***a* extending in the longitudinal direction, which are designed to engage in the respective groove sections **511***a* and **512***a* of the connecting strips **511** and **512** of the sealing element **500** and/or to be slided in into them in the longitudinal direction, so that the profile rails **421***a* and **422***a*, which have a T-shape, for example, are fastened to the groove sections **511***a* and **512***a* and/or to the connecting strips **511** and **512** of the sealing element **500** and/or are connected to them in a sealing manner. The connecting strips **511** and **512** of the sealing element **500** as well as the profile rails **421***a* and **422***a* of the fastening strips **421** and **422** extend, for example, in the longitudinal direction parallel to the longitudinal edges **311** and **312** of the core mantle **310** and can preferably be displaced in relation to one another in the longitudinal direction, but they are preferably positively connected in the transverse direction and/or transversely to the longitudinal direction. In particular, the connecting strips **511** and **512** of the sealing element **500** are each connected to the fastening strips **421** and **422** so that they can be slidably displaced in the longitudinal direction, for example, with the movement transverse to the longitudinal direction being blocked in a form-fitting manner (i.e. for example only one remaining degree of translatory freedom). This has the advantage that the sealing element **500** can be replaced easily and inexpensively, e.g. when signs of wear occur, by the sealing element **500** being held on the fastening strips **421** and **422** so that it can be pulled out in the longitudinal direction. For example, the sealing element **500** can advantageously simply be slidably pulled out of the longitudinal opening of the core mantle **310** in the longitudinal direction and a sealing element **500** of the same construction and/or a sealing element having analogous connecting strips **511** and **512** can be slidably inserted in the longitudinal direction.

The sealing element **500** is configured, for example, to seal off the interior of the mold core **300** during the concrete pouring process and to prevent liquid from penetrating into the interior of the mold core **300**. For this purpose, the sealing element **500** has, for example, a connecting band **520** which is arranged between the connecting strips **511** and **512** and is connected to the connecting strips **511** and **512**, which connecting band **520** is, for example, flexible and/or preferably elastically bendable (particularly preferably bendable or deformable about a longitudinal axis of the sealing element **500**). For example, the connecting band **520** can consist of an elastically bendable or elastically formable material, such as an elastic plastic, and/or can comprise a section consisting of an elastically bendable material, such as an elastic plastic. In preferred examples, the connecting band **520** comprises an elastomer and/or the connecting band **520** consists of an elastomer.

In the expanded state shown as an example in FIG. **8**, the round shape of the elastic connecting band **520** (see, e.g. also FIG. **5**) is specified, for example, by a shaped plate **490** (shaped plate), with the shaped plate **490** being attached (in particular on the side facing away from the lever element **440** and/or from the hydraulic cylinder **430**) to the sword element **410** (see e.g. also FIG. **6**). When the sword element **410** is pulled inwards during the shrinking of the mold core **300** by the expansion device **400**, the shaped sheet metal **490** also lifts off of the elastic connecting band **520** of the sealing element **500** and is pulled inwards, for example. In addition (as described further above by way of example), the longitudinal edges **311** and **312** of the wall of the core **310** are pushed towards each other, for example, so that the connecting strips **511** and **512** of the sealing element **500** are also pushed towards each other, for example. When the mold core **300** shrinks, this also leads, for example, to a bending of the elastic connecting band **520** of the sealing element **500** folding inwards. The outward bending of the elastic connecting band **520** of the sealing element **500** is prevented in this process (e.g. when demoulding a hardened concrete body) by the inner surface of the hardened concrete body B lying against the sealing element **500** on the outside. This results in the technical advantage that the sealing element **500** and/or the flexibly and/or elastically bendable connecting band **520** of the sealing element **500** is not initially pulled inwards, but rather is bent inwards, with the advantageous avoidance of tensile forces acting on the connecting band **520**, by the pushing together of the longitudinal edges **311** and **312** of the core mantle **310**. Due to the avoidance of tensile forces acting on the sealing element **500**, this advantageously leads to less stress acting on the sealing element **500** and/or the flexibly and/or elastically bendable connecting band **520** of the sealing element **500** and thus to an improvement in the wear behavior and/or to the advantageous avoidance of above-average signs of wear on the sealing element **500** and/or on the connecting band **520** of the sealing element **500**. Should the sealing element **500** nevertheless be worn out after repeated use and/or after a large number of casting processes and/or shrinkage processes, e.g. due to cracking, it can still quickly, efficiently, inexpensively and easily replaced according to the above description. Overall, there is a significant improvement in the service life of the molding apparatus **1000** due to the reduced wear of the sealing element **500** on the one hand and the simpler and/or quicker possibility of replacing the sealing element **500** on the other.

FIG. **11** shows an example cross-sectional view of the example expansion device **400** of FIG. **7** (section C-C of FIG. **10**). The illustration is analogous to FIG. **8** by the plan view of the expansion mechanism **400**B. However, as an example, bores **421***b* and **422***b* are also shown on the fastening strips **421** and **422**, to which the fastening strips **421** and **422** (and thus the expansion device **400**) can be fastened to fastening strips on the longitudinal edges **311** and **312** of the core mantle **310**. Additionally, an example guide member **600**D is shown in FIG. **11**. Such guide elements **600**A to **600**E are, for example, held one behind the other at several positions in the center of the guide plate **490** in the longitudinal direction (see also FIGS. **6** and **7**), in particular at the respective bores in the shaped plate **490** (see FIG. **11**). The guide element **600**D has, for example, on the side of the shaped sheet metal **490** facing the sealing element **500**, a stamping section **601** which is fastened, for example, with a screw **602** extending through the respective bore of the shaped sheet metal **490**. For example, the screw **602** extends further through a spacer sleeve **603**, which also extends through the respective bore of the shaped sheet **490**, wherein the spacer sleeve **603** has, on the side of the shaped sheet **490** facing away from the sealing element **500**, for example, a driver section **603***a* with an enlarged diameter. The sealing element **500** has, for example, on the side facing the interior of the mold core **300**, for example, a profile strip **530** extending in the longitudinal direction in the middle, which is fastened, for example, to the connecting band **520** of the sealing element **500**. The profile strip **530** has, for example, a receiving groove **530***a*, which is opened inwards toward the interior of the mold core, for the stamping sections **610** of the guide elements **600**A to **600**E (see also FIG. **12**). The receiving groove **530***a* of the profile strip **530** has, for example, a T-shape in cross-sectional profile (see also FIG. **12**, for example), which is adapted, for example, to the cross-sectional profile of the stamping section **601** of the guide elements **600**A to **600**E. In the process of shrinking the mold core **300**, when the sword element **410** and thus also the shaped sheet **490** are pulled radially into the interior of the mold core **300**, the shaped sheet **490** moves inwards and lifts off the connecting band **520** of the sealing element **500**. Here, the shaped sheet **490** moves a preset stroke distance inwards (upward in FIG. **10**), for example, which is preset with the length of the spacer sleeve **603** and/or the screw length of the screw **602**, until the upper side of the shaped sheet **490** comes into contact with the driver section **603***a* of the spacer sleeve **603** and takes the spacer sleeve **603** and/or the driver section **603***a* of the spacer sleeve **603** with it, so that, after the movement of the exemplary preset stroke distance (without tensile forces acting on the sealing element **500**), the guide elements **600**A to **600**E carried along by the shaped sheet metal **490** via the stamp sections **601** inserted in the profile strip **530**, thereby guiding the sealing element **500** and/or its inward bending during the shrinking process.

According to the above examples, the expansion device is configured, for example, to carry out the shrinking process in two steps and/or as two-staged shrinking, in particular with preferably a single continuous lifting movement of the mechanism driving both shrinking steps, herein for example by the hydraulic cylinder **430**. For example, in the first step (e.g. first stage of the continuous shrinking process), the sword element **410** and thus also the shaped sheet metal **490** are pulled radially into the interior of the mold core **300**, with the shaped sheet metal **490** moving inwards and being lifted off of the connecting band **520** of the sealing element **500**, for example without tensile force in this first step being exerted on the sealing member **500**. If the continuous lifting movement is continued by the single and/or the same drive (e.g. the hydraulic cylinders), the upper side of the shaped sheet metal **490** comes into contact with the driver section **603***a* of the spacer sleeve **603** (transition to the second step and/or to the second stage of the continuous shrinking process), for example, and the shaped sheet metal **490** then, for example, takes the spacer sleeve **603** and/or the driver section **603***a* of the spacer sleeve **603** with it in the second step, so that in the second step, for example, the sealing element **500** is now also carried along during the shrinking movement of the mold core **300** driven by the same drive mechanism. As a result, this example has the technical advantage that the sealing element **500** and/or the flexible and/or elastically bendable connecting band **520** of the sealing element **500** is not initially pulled inwards, but rather is bent inward, with the advantageous avoidance of tensile forces acting on the connecting band **520**, due to the pushing together of the longitudinal edges **311** and **312** of the core mantel **310**, wherein the bending of the sealing element **500** also is advantageously guided, for example, by the guide elements **600**A to **600**E and being held in the shrunken state.

Due to the avoidance of tensile forces acting on the sealing element **500**, despite the advantageous guidance by the guide elements **600**A to **600**E, there is advantageously less stress on the sealing element **500** and/or the flexibly and/or elastically bendable connecting band **520** of the sealing element **500**, and thus an improvement in the wear behavior and/or an advantageous avoidance of above-average wear and tear on the sealing element **500** and/or on the connecting band **520** of the sealing element **500** is achieved. Should the sealing element **500** nevertheless wear out after repeated use and/or after a large number of casting processes and/or shrinkage processes, e.g. due to cracking, it can still be replaced quickly, efficiently, inexpensively and easily according to the above description, wherein in this case, the stamp sections **601** of the guide elements **600**A to **600**E are also pushed in into the receiving groove **530***a* of the profile strip **530** (guide strip) of the sealing element **500** when the sealing element **500** is pushed in in the axial direction. Overall, there is a significant improvement in the service life of the forming device **1000** due to the lower wear of the sealing element **500** on the one hand and the simpler and/or faster possibility of replacing the sealing element **500** with simultaneous excellent guidance of the bending process on the other.

FIG. **12**A shows an exemplary profile view of a sealing member **500** for use on a mold core **300** according to an exemplary embodiment of the present disclosure. The sealing element **500** is preferably in the form of a strip, with the longitudinal edges of strip-shaped sealing element **500** being provided, for example, with connecting strips **511** and **512**, which are arranged opposite one another on the flexibly and/or elastically bendable (preferably strip-shaped) connecting band **520** arranged between connecting strips **511** and **512** of the sealing element **500**, e.g. by an adhesive connection or at least supported by an adhesive connection. By way of example, the connecting strips **511** and **512** have the receiving grooves **511***a* and **512***a*, which are open laterally to the outside, for receiving the rail profiles **421***a* and **422***a* of the fastening strips **421** and **422** for sealing attachment to the mold core **300** and/or the core mantle **310**. The receiving grooves **511***a* and **512***a* have, for example, a T-shape in the cross-sectional profile. In the middle, the sealing element **500** also has, for example, a profile strip **530** extending in the longitudinal direction, which is fastened to the connecting band **520** of the sealing element **500**, for example. The profile strip **530** has, for example, an outwardly open receiving groove **530***a* for receiving the above-described stamping sections **610** of the guide elements **600**A to **600**E.

For example, the profile strip **530** is embedded in the connecting band **520** of the sealing element **500** in such a way that the outside of the profile strip **530** terminates with the outside of the connecting band **520** of the sealing element **500** and does not and/or does not substantially protrude beyond it. Here, the profile strip **530** can be connected to the connecting band **520** of the sealing element **500** by a non-positive connection (e.g. an adhesive connection) or at least supported by a non-positive connection. In addition, the profile strip **530** has, for example, laterally protruding profile webs **530***b* in order to strengthen the connection between the profile strip **530** and the connecting band **520** and to avoid and/or prevent the connection from tearing off during repeated bending movements of the connecting band **520**. To strengthen the connection of the connecting band **520** to the connecting strips **511** and **512** and in particular to reduce the risk of tearing off in the edge area of the connecting band **520**, the connecting strips **511** and **512** can also have profile sections protruding into the material of the connecting band **520** (possibly similar to the profile webs **530***b* of the profile strip **530**). This improves the longevity of the connection of the connecting band **520** to the connecting strips **511** and **512** over the entire length of the sealing element **500** and thus avoids partial tearing off at the edges even if the sealing element **500** is used multiple times in shrinking and/or expansion processes on the mold core **300**.

FIG. **12**B shows an exemplary profile view of a sealing member **500** for use on a mold core **300** according to another exemplary embodiment of the present disclosure. The features from FIG. **12**A are taken up here by way of example. To strengthen the connection of the connecting band **520** to the connecting strips **511** and **512** and in particular to reduce the risk of tearing off in the edge area of the connecting band **520**, the connecting strips **511** and **512** have, for example, respective anchor profile sections **511***b* and **512***b* protruding into the material of the connecting band **520**. This improves the longevity of the connection of the connecting band **520** to the connecting strips **511** and **512** over the entire length of the sealing element **500** and thus avoids partial tearing off at the edges even if the sealing element **500** is used multiple times in shrinking and/or expansion processes on the mold core **300**

FIG. **12**C shows an exemplary profile view of a sealing element **500** for use on a mold core **300** according to another exemplary embodiment of the present disclosure. The features from FIG. **12**B are taken up here by way of example, the profile strip **530** being dispensed with by way of example (elements **600**A to **600**E can then be omitted in the expansion device). To strengthen the connection of the connecting band **520** to the connecting strips **511** and **512** and in particular to reduce the risk of tearing off in the edge area of the connecting web band **520**, the connecting strips **511** and **512** again have, for example, respective anchor profile sections **511***b* and **512***b* protruding into the material of the connecting band **520**. In addition, the connecting strips **511** and **512** have, for example, respective nose profile sections **511***c* and **512***c* protruding into the material of the connecting band **520**, which protrude transversely to the anchor profile sections **511***b* and **512***b* into the material of the connecting band **520**, for example. This improves the longevity of the connection of the connecting band **520** with the connecting strips **511** and **512** over the entire length of the sealing element **500** even more and thus leads to an improved avoidance of partial tearing off at the edges, even if the sealing element **500** is used several times in shrinking and/or expansion processes on the mold core **300**.

FIG. **12**D shows an exemplary profile view of a sealing member **500** for use on a mold core **300** according to another exemplary embodiment of the present disclosure. The features from FIG. **12**C are taken up here by way of example, the profile strip **530** being provided analogously to FIG. **12**A by way of example.

In examples, the sealing elements are preferably designed such that their cross-sectional width is substantially at least four times, in particular at least five times greater than the cross-sectional height of the connecting band, particularly preferably at least eight times greater than the cross-sectional height of the connecting band. In the above examples, the cross-sectional width is substantially ten times greater than the cross-sectional height of the connecting band.

In the above examples, an expansion device **400** and a sealing element **500** were shown on the mold core **300** in each case. However, in further examples it is also possible to provide a mold core with a core mantle (wall of the core) with a plurality of longitudinal openings and a plurality of sealing elements sealing the respective longitudinal openings. For example, in the case of an oval shroud shape, both opposite sides of the shroud can be provided with a respective expansion device and/or a respective sealing element. In the case of angular core mantle cross-sections (triangular, square, pentagonal, . . . , polygonal; e.g. with rounded corners), several and/or all sides between two corners of the wall of the core cross-section can be provided with appropriate expansion devices and/or sealing elements. Examples of the present disclosure have been described and proposed above, so that with regard to the disadvantages of the known prior art, mold cores according to the disclosure for molding apparatuses for the production of hollow and/or in particular tubular concrete bodies and accessories and spare parts (e.g. the sealing elements described) for such mold cores can be proposed and/or provided, in which a cost-effective arrangement that reliably seals the core mantle inwards can be provided, which also enables improved service life, is able to reduce material fatigue and/or wear and/or allow for easier handling in the event of material fatigue and/or wear and tear. It should be pointed out again that only examples and/or examples of the present disclosure and their advantages have been described in detail above with reference to the attached figures. It should be emphasized again that the present disclosure is in no way limited and/or limited to the above-described embodiments and their embodiment features and/or their described combinations, but also includes modifications of the embodiments, in particular those that are made possible by modifications of the features of described examples and/or by combination and/or partial combination of one or more of the features of the described examples are included within the scope of the independent claims.

The invention claimed is:

1. Sealing element for use with a mold core for use in a molding apparatus for the production of hollow concrete bodies, the mold core comprising a core mantle extending in the longitudinal direction, the core mantle having a strip-shaped longitudinal opening extending between two longitudinal edges of the core mantle in the longitudinal direction of the core mantle, and an expansion device for expanding and/or contracting the mold core, wherein

the sealing element has lateral connecting strips extending in the longitudinal direction and a connecting band which is arranged between the connecting strips and is connected to the connecting strips on both sides,

wherein a cross-sectional profile of the connecting strips of the sealing element each has one or more retaining profile sections protruding and/or engaging into the material of the connecting band, and wherein the sealing element is configured to be connected to the two longitudinal edges of the core mantle, the lateral connecting strips being configured to be held at the longitudinal edges of the core mantle.

2. Sealing element according to claim **1**, wherein

the sealing element on the mold core is configured to be removably held to be pulled out and/or can be pulled out in the longitudinal direction from the longitudinal opening of the core mantle.

3. Sealing element according to claim **1**, wherein

respective longitudinal edges of the sealing member facing the longitudinal edges of the core mantle are respectively configured to be connected to the respective longitudinal edges of the core mantle slidably displaceable in the longitudinal direction.

4. Sealing element according to claim **1**, wherein

the sealing element is configured to be positively connected to the longitudinal edges of the core mantle in a direction transverse to the longitudinal direction of the mold core in the radial direction of the mold core and/or substantially perpendicular to the radial direction of the mold core relative to the mold core.

5. Sealing element according to claim **1**, wherein

the lateral connecting strips of the sealing element are configured to be held slidably displaceable in the longitudinal direction at the longitudinal edges of the core mantle at respective fastened fastening strips fastened to the longitudinal edges of the core mantle.

6. Sealing element according to claim **5**, wherein

the connecting strips of the sealing element have one or more profile groove sections extending in the longitudinal direction, wherein respective corresponding profile rail sections of the fastening strips engage into the profile groove sections slidably displaceable in the longitudinal direction;

and/or

the connecting strips of the sealing element have one or more profile rail sections extending in the longitudinal direction, wherein the profile rail sections engage slidably displaceable in the longitudinal direction into respective corresponding profile groove sections of the fastening strips.

7. Sealing element according to claim **6**, wherein

one or more profile groove sections and/or their corresponding one or more profile rail sections have a T-shape in cross-sectional profile.

8. Sealing element according to claim **1**, wherein

the connecting band of the sealing element is a flexible and/or elastically bendable connecting band, which comprises an elastic plastic and/or an elastomer.

9. Sealing element according to claim **1**, wherein

the connecting band of the sealing element is attached to the connecting strips via a non-positive connection and/or via an adhesive connection.

10. Sealing element according to claim **1**, wherein

the one or more retaining profile sections include one or more anchor and/or nose profile sections.

11. Sealing element according to claim **1**, wherein

at least one of the connecting strips of the sealing element in the cross-sectional profile has a plurality of holding profile sections aligned transversely to one another and protruding and/or engaging into the material of the connecting band.

12. Mold core for use in a molding apparatus for the production of hollow concrete bodies, the mold core comprising:

a core mantle extending in the longitudinal direction, the core mantle having a strip-shaped longitudinal opening extending between two longitudinal edges of the core mantle in the longitudinal direction of the core mantle,

an expansion device for expanding and/or contracting the mold core, and

a sealing element sealing the longitudinal opening of the core mantle,

wherein the sealing element has lateral connecting strips extending in the longitudinal direction and a connecting band which is arranged between the connecting strips and is connected to the connecting strips on both sides,

wherein a cross-sectional profile of the connecting strips of the sealing element each has one or more retaining profile sections protruding and/or engaging into the material of the connecting band, and

wherein the sealing element is connected to the two longitudinal edges of the core mantle, the lateral connecting strips of the sealing element being held at the longitudinal edges of the core mantle.

13. Mold apparatus for the production of hollow concrete bodies, comprising:

an outer mold and

an inner mold arranged in the outer mold and comprising a mold core,

the mold core comprising:

a core mantle extending in the longitudinal direction, the core mantle having a strip-shaped longitudinal opening extending between two longitudinal edges of the core mantle in the longitudinal direction of the core mantle,

an expansion device for expanding and/or contracting the mold core, and

a sealing element sealing the longitudinal opening of the core mantle,

wherein the sealing element has lateral connecting strips extending in the longitudinal direction and a connecting band which is arranged between the connecting strips and is connected to the connecting strips on both sides,

wherein a cross-sectional profile of the connecting strips of the sealing element each has one or more retaining profile sections protruding and/or engaging into the material of the connecting band, and

wherein the sealing element is connected to the two longitudinal edges of the core mantle, the lateral connecting strips of the sealing element being held at the longitudinal edges of the core mantle.

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