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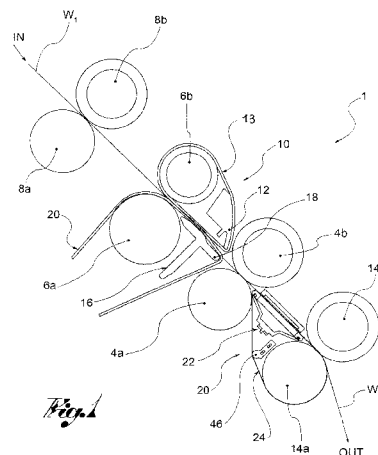
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(54) Title: DEVICE FOR COMPACTING A YARN IN A SPINNING MACHINE



(57) Abstract: A device (20) for compacting a fibre yarn (W1) comprises a first pair of drawing cylinders (4a, 4b) and an auxiliary pair of cylinders comprising an auxiliary cylinder (14a) and a pressure cylinder (14b) in pressure contact therewith, downstream of the first pair of drawing cylinders. A suction table (22) is positioned between the first pair of drawing cylinders and the auxiliary pair of cylinders and is provided with a suction aperture (34); an auxiliary belt (24) permeable to air and passing over the suction aperture (34) slides on the suction table (22). The auxiliary cylinder (14a) is moved by the first drawing cylinder (4a).



DESCRIPTION**"DEVICE FOR COMPACTING A YARN IN A SPINNING MACHINE".**

[0001] The present invention relates to a device for compacting a yarn in a spinning machine.

[0002] Numerous embodiments of compacting devices for spinning machines exist.

[0003] Some solutions perform mechanical condensing, that is to say they substantially channel the fibre yarn into a funnel-shaped duct, so as to draw the fibres closer together, thereby compacting the yarn. Such solutions do not however permit removal of the dust from the yarn.

[0004] The embodiments exploiting a current of aspirated air which acts on the fibres bringing them closer together, thereby compacting the yarn, are however particularly widespread.

[0005] Such solutions are particularly appreciated, in that they permit the contemporary compacting of the yarn and the removal of dust from it, with a significant improvement in the quality of the yarn obtained in the spinning machine. An example of one embodiment is described in the International Application WO 2012/063150 in the name of the Applicant.

[0006] The purpose of the present invention is to make an improved compacting device compared to the solutions of the prior art.

[0007] Such purpose is achieved by a compacting device according to claim 1 below. The dependent claims describe embodiment variants.

[0008] The characteristics and advantages of the compacting device according to the present invention will be evident from the description below, made by way of a non-limiting example, according to the attached figures, wherein:

[0009] - figure 1 shows a cross-section view, according to a plane containing the direction of advancement of a fibre yarn, of a drawing device of a spinning machine comprising a compacting device according to the present invention;

[0010] - figure 2 shows a modular compacting group according to the present invention, according to an observation point on the input side;

[0011] - figure 3 shows the modular group in figure 2, from a viewpoint on the output side;

[0012] - figure 4 shows the modular group in figure 2, engaged with conveying means;

[0013] - figure 5 shows a cross-section view, according to a plane perpendicular to the direction of advancement of the yarn, of the modular group in figure 4;

[0014] - figure 6 shows the drive means of an auxiliary cylinder of the compacting device according to the present invention;

[0015] - figure 7 shows a cross-section view of the drawing device and drive means of the auxiliary cylinder of the compacting device;

[0016] - figure 8 shows a drive assembly with drive means of the auxiliary cylinder and a support carriage of the pressure cylinders;

[0017] - figure 9 shows a transmission group of the drive means in figures 6, 7 and 8;

[0018] - figure 10 shows a diagram of a suction apparatus for the compacting devices according to the present invention;

[0019] - figure 11 shows a modular compacting group according to a further embodiment of the present invention;

[0020] - figure 12 shows the modular group in figure 11, from above;

[0021] - figure 13 shows a cross-section view, according to a plane perpendicular to the direction of advancement of the yarn, of the modular group in figure 11;

[0022] - figure 14 shows a cross-section view, according to a plane parallel to the direction of advancement of the yarn, of the modular group in figure 11;

[0023] - figure 15 shows a transmission group of the drive means, according to a further embodiment;

[0024] - figure 16 shows the drive means of the auxiliary

cylinder of the compacting device according to a further embodiment of the present invention;

[0025] - figure 17 shows the drive assembly with drive means of the auxiliary cylinder and a support carriage of the pressure cylinders, according to a further embodiment of the present invention; and

[0026] - figure 18 shows a transmission group of the drive means, according to a further embodiment of the present invention.

[0027] A spinning machine in a spinning line comprises a plurality of spinning points, each spinning point comprising a spindle for the formation of a reel of yarn.

[0028] Each spinning point further comprises a drawing device 1, which a yarn W1 goes into and a drawn yarn comes out of, and a compacting device 20, from which a compacted yarn W3 emerges, generally destined to be twisted and wound to form the reel.

[0029] According to a preferred embodiment, the drawing device 1 comprises, in an opposite direction to that of advancement of the yarn, a first pair of cylinders, formed of a first lower or drawing cylinder 4a and a first pressure cylinder 4b, which surmounts the first drawing cylinder and is in contact under pressure with it, to draw the yarn in transit.

[0030] The drawing device 1 further comprises, a second

pair of cylinders, upstream of the first pair of cylinders, formed of the second drawing cylinder 6a and the second pressure cylinder 6b, and a third pair of cylinders, upstream of the second pair of cylinders, formed of the third drawing cylinder 8a and the third pressure cylinder 8b.

[0031] The pairs of cylinders have different rotation speeds, so as to achieve drawing of the yarn in advancement; in general, the peripheral rotation speed of the second pair of cylinders is greater than that of the third pair and the peripheral rotation speed of the first pair is greater than that of the second pair.

[0032] The ratios between the peripheral speeds of rotation define the drawing ratios; in general, the drawing ratio between the second and the third pair is much smaller than the drawing ratio between the first and the second pair: this means that the drawing of the yarn is slight between the third and the second pair and very strong between the second and the first pair of cylinders.

[0033] Preferably, the drawing device 1 comprises a drawing cage 10 between the third pair of cylinders and the first pair of cylinders which the second pair of cylinders is part of.

[0034] The cage 10 comprises an inversion abutment 12, downstream of the second pressure cylinder 6b, distanced

from it, and an upper belt 13, wound around the second cylinder 6b, by which it is dragged in movement, and around the inversion abutment 12, thereby forming a closed path.

[0035] The cage 10 further comprises a fixed lower guide 16, positioned downstream of the second drawing cylinder 6a, distanced from it, having a main portion 18 which extends mainly in the direction of advancement of the yarn terminating next to the abutment 12, and a lower belt 20, wound around the second drawing cylinder 6a, by which it is dragged in movement, and around the main portion 18, so as to form a closed path.

[0036] The two belts 13, 20 are in contact along a section aligned with the gap between the second pair of cylinders and the first pair of cylinders, and the yarn is dragged between them.

[0037] At the exit of the cage 10, the yarn passes through the first pair of cylinders and then enters the compacting device 20, which it comes of as a compacted yarn W3.

[0038] The compacting device 20 comprises an auxiliary pair of cylinders, downstream of the first pair of drawing cylinders, comprising an auxiliary cylinder 14a, supported at the ends by a pair of rolling bearings 15a, 15b, and a respective pressure cylinder 14b, which

surmounts the auxiliary cylinder and is in pressure contact therewith.

[0039] Preferably, the pressure cylinders 4b, 6b, 8b, 14b and/or drawing cylinders 4a, 6a, 8a and/or the auxiliary cylinder 14a have a rubber surface, to increase the adhesion with the yarn in transit.

[0040] Preferably, the auxiliary pair of cylinders has a greater peripheral rotation speed than the pair of cylinders immediately upstream, to obtain a tensioning of the yarn in transit.

[0041] Generally, the drawing ratios in the pre-drawing area, i.e. in the embodiment shown, between the second pair of drawing cylinders and the third pair of drawing cylinders, are variable between 1.10 and 1.40; the drawing ratios in the drawing area, i.e. in the embodiment shown, between the first pair of drawing cylinders and the second pair of drawing cylinders, are variable between 20 and 60; the tensioning ratios between the auxiliary pair of cylinders and the first pair of drawing cylinders is variable between 1.01 and 1.10.

[0042] The suction device 20 further comprises a suction table 22 and an auxiliary belt 24 permeable to air, wound around the auxiliary cylinder 14a and the suction table 22 to form a closed path. The auxiliary belt 24 is pressed between the auxiliary cylinder 14a and the

relative pressure cylinder 14b.

[0043] The auxiliary belt 24 passes over a suction aperture 34 of the suction table 22 and the yarn destined for compacting positions itself thereon.

[0044] The suction table 22, positioned downstream of the first pair of drawing cylinders and upstream of the auxiliary pair of cylinders, extends along the direction of advancement of the yarn between the gap of the first pair of drawing cylinders, very close to the point of minimum distance, and the gap of the auxiliary pair of drawing cylinders, very close to the point of minimum distance.

[0045] The suction table 22 has a main surface 30, preferably flat, on which the auxiliary belt 24 slides, which has the suction aperture 34 operatively connected to forced suction means to exert a suction action on the yarn in transit on the auxiliary belt 24 permeable to the air.

[0046] Preferably, the suction aperture 34 has an elongated slot shape along the direction of advancement of the yarn, for example along an aperture axis K, inclined in relation to the direction of advancement Z.

[0047] Preferably, moreover, the suction table 22 comprises a pair of channelling walls 38, projecting from the main surface 30, between which the auxiliary belt 24 is

positioned.

[0048] Preferably, the auxiliary belt 24, in its closed path, is in contact, at least for a section, with the surface of the first lower cylinder 4a. Advantageously, this permits cleaning of the auxiliary belt 24 from dirt, dust and fibres.

[0049] The compacting device 22 further comprises means for conveying the flow of aspirated air, suitable to définé, near the suction aperture 34, a transit chamber of the yarn to be compacted.

[0050] According to a preferred embodiment, said conveying means comprise a plate 40 applicable to the suction table 22 on the side of the main surface 30, for example, leaning on the channelling walls 38 thereof.

[0051] The plate 40 has an inner surface, facing the main surface 30, and an opposite outer surface. When the plate 40 has been applied to the suction table 22, a transit chamber, through which the yarn in compaction passes, is formed between the inner surface of the plate 40 and the main surface 30 of the suction table 22.

[0052] Preferably, the plate 40 has a recess 42 on the input side of the yarn (and preferably a similar recess on the output side), which, together with the suction table 22, defines an entrance for the yarn to be compacted (and preferably the analogous recess on the

output side defines an exit for the compacted yarn).

[0053] Advantageously, the conveying means, conveying the flow of aspirated air from the suction aperture 34, enhance the suction action.

[0054] Preferably, moreover, the conveying means comprise non-rigid support means suitable to support the conveying means so as to position themselves in a manner accommodating the suction table 22.

[0055] For example, said support means 44 comprise a cylindrical or spherical constraint, applied to the plate 40, so that the plate positions itself in a manner accommodating the suction table 22, absorbing machine or assembly tolerances.

[0056] According to a preferred embodiment, moreover, the compacting device comprises at least one tensioner 46 for the auxiliary belt 24.

[0057] For example, said tensioner 46 is of the gravitational type.

[0058] A modular suction group 50 according to the present invention comprises a pair of tables 22 and a pair of respective auxiliary belts 24, to be applied to two adjacent spinning points.

[0059] The modular group 50 comprises a single main suction duct 52, which extends along a main suction direction X.

[0060] The modular group 50 further comprises a joining

body 54, from which from the main suction duct 52 protrudes, which extends along a joining axis Y, perpendicular to the main suction axis X.

[0061] On the inside, the joining body 54 is hollow and is separated into two compartments 56 in communication with the main suction duct 52 by a partition wall 58, which extends along said joining axis Y.

[0062] The modular group 50 further comprises two intermediate ducts 60, each of which extends along an intermediate axis H, coincident for the two ducts 60, perpendicular to the joining axis Y and the suction axis X.

[0063] Each intermediate duct 60 is delimited along the intermediate axis H by the partition wall 58, so as to be mutually separate.

[0064] Furthermore, the modular group 50 comprises a pair of end tangs 62, internally hollow, each sealingly coupled, for example by an O-ring 64, to the respective intermediate duct 60.

[0065] The end tang 62 supports the suction table 22 of the compacting device, with a sealed engagement, for example by an O-ring 66, and is provided internally with an elbow duct 68 in communication with the suction aperture 34 of the suction table 22.

[0066] Preferably, the main suction duct 52 is made in one

piece with connection means suitable to connect the modular group 50 to a support frame of the spinning machine.

[0067] Preferably, moreover, the joining body 54 and the intermediate ducts 60 are made in one piece, sealingly coupled, for example by an O-ring 70, to the piece which contains the main suction duct 52, also provided with connection means of the modular group 50 to the frame of the spinning machine.

[0068] Preferably, moreover, the end tang 62 is made in one piece and is sealingly coupled to the intermediate duct 60.

[0069] Preferably, moreover, the suction table 22 is made in one piece and is sealingly coupled to the end tang 62.

[0070] A compacting assembly according to the present invention comprises a plurality of compacting devices 20, i.e. a plurality of modular groups 50 aligned along the auxiliary cylinder 14a, and drive means for moving the auxiliary cylinder 14a.

[0071] The drive means comprise a plurality of transmission groups 200, suitable for the transmission of a rotational movement from a motorised cylinder to the auxiliary cylinder 14a, for example from a drawing cylinder, for example from the first drawing cylinder 4a of the first pair of drawing cylinders to the auxiliary cylinder 14a.

[0072] The transmission group 200 comprises an idle transmission roller 202, for example consisting of two separate and coaxial wheels 202a, 202b, made of rubber or coated in rubber.

[0073] The transmission roller 202 is supported by a stem 204 ending in a base 208.

[0074] The transmission group 200 further comprises a support 206 for attachment to a frame of the spinning machine, crossed by the stem 204.

[0075] Preferably, moreover, the transmission group 200 comprises elastic return or thrust means, suitable to operate permanently on the transmission roller 202, for example through the stem 204, to return the transmission roller 202 towards the support 206 or to push the transmission roller away from the support 206.

[0076] For example, said elastic means comprise a spring 210, placed in compression or in tension between the support 206 and the base 208.

[0077] The transmission roller 202 is in contact with the auxiliary cylinder 14a and with a motorised cylinder, for example a drawing cylinder, for example the first drawing cylinder 4a. The elastic means operate so as to keep the transmission roller in contact with the two cylinders.

[0078] In other words, while the drawing cylinders 4a, 6a, 8a are connected to motorised means, for example,

provided with electric motors, positioned in heads of the spinning machine, usually placed at the ends of the spinning machine or in an intermediate position, the auxiliary cylinder 14a is moved by means of the transmission group which takes its rotary movement from one of said drawing cylinders.

[0079] In particular, the transmission rollers 202 are positioned interspersed by at least one modular suction group 50, for example by two modular suction groups, i.e. are positioned every four spinning points.

[0080] A drive assembly 250 according to the present invention comprises the compacting assembly, comprising a plurality of compacting devices 20, i.e. a plurality of modular groups 50 aligned along the auxiliary cylinder 14a, and drive means for moving the auxiliary cylinder 14a, a plurality of pressure cylinders 4b aligned along the respective drawing cylinder 4a and engaged therewith, a plurality of pressure cylinders 14b aligned along the auxiliary cylinder 14a and engaged therewith, and a carriage 252 for supporting the pressure cylinders 4b, 14b.

[0081] For example, said carriage 252 comprises a central frame 254 which supports, on one side, a pair of coaxial pressure cylinders 14b, engageable with the auxiliary cylinder 14a, and, on the other side, a pair of coaxial

pressure cylinders 4b, engageable with the drawing cylinder 4a.

[0082] The carriage 252 is movable to place in contact or separate the pressure cylinders 4b, 14b with/from the respective drawing cylinder 4a and the auxiliary cylinder 14a.

[0083] A suction apparatus 300 according to the present invention is connected to a plurality of modular groups 50, and in particular to a plurality of main suction ducts 52 of said modular groups 50.

[0084] In particular, the suction apparatus 300 comprises a plurality of end suction ducts 302, each coupled to the relative main suction duct 52 of the modular group 50, and a secondary collecting duct 304, to which the end suction ducts 302 are connected.

[0085] Each secondary collecting duct 304 is closed at one end by a plug 306 which can be opened to clean the secondary duct 304.

[0086] The suction apparatus 300 comprises a plurality of secondary collecting ducts 304 and a single main collecting duct 308, operatively connected for suction to the secondary collecting ducts 304.

[0087] Preferably, the main collecting duct 308 is provided with a plug 310 at one end, which can be opened to clean the main duct 308.

[0088] The suction apparatus 300 further comprises, preferably, a single suction fan, preferably positioned at one end of the spinning frame, operatively connected for suction with the main collecting duct 308.

[0089] The entire spinning machine is thus divided into the following sections, wherein each section comprises a plurality of spinning points, for example 24, which the respective modular suction groups 50, for example 12, are applied to; for each section, the modular groups are connected for suction with a secondary collecting duct 304. All the secondary collecting ducts 304 are lastly connected for suction to the main collecting duct 308, one for each spinning machine, to which the fan is connected.

[0090] Each section provides for the respective auxiliary cylinder 14a, which does not therefore extend along the entire spinning machine. Rather, the spinning machine includes a plurality of coaxial and axially separate auxiliary cylinders so as to facilitate the assembly operations of the replacement auxiliary belts 24 during maintenance operations.

[0091] The elastic means acting on the transmission roller 202 make it possible to distance the roller 202 from the auxiliary cylinder, to permit the assembly operations of replacement belts.

[0092] Innovatively, the compacting device according to the present invention is particularly effective.

[0093] Advantageously, moreover, the compacting device according to the present invention is easy to assemble and dismantle for maintenance operations.

[0094] According to a further advantageous aspect, the action of the flow of suction air is particularly effective.

[0095] Advantageously, moreover, the drive means of the auxiliary cylinder show little wear, even for long periods of use.

[0096] According to a further advantageous aspect, the drive means are not influenced by dust or short fibres, which generally accumulate in the transmission devices of the solutions of the prior art.

[0097] According to yet a further advantageous aspect, the suction apparatus according to the present invention makes it possible to minimise the power used, providing for a single fan, and to easily perform cleaning operations of the ducts.

[0098] According to an embodiment variant, the compacting device is positioned downstream of the third pair of drawing cylinders and upstream of the second pair or downstream of the second pair of drawing cylinders and upstream of the first.

[0099] According to a further embodiment, the auxiliary pair of cylinders 14a, 14b has a peripheral rotation speed less than the pair of cylinders immediately upstream, for example less than the peripheral speed of the first pair of drawing cylinders 4a, 4b, to achieve a compacting of the yarn in transit due to slowing-down.

[00100] For example, the ratio between the peripheral speed of the cylinders 14a, 14b of the auxiliary pair of cylinders and the peripheral speed of the cylinders 4a, 4b of the first pair of drawing cylinders is variable between 0.9 and 1.1.

[00101] According to yet a further embodiment, the portions of the auxiliary cylinder 14a in contact with the auxiliary belt 24 are smooth, i.e. without scoring or areas machined to increase the grip of the belt.

[00102] Preferably, the suction aperture 34 has an elongated shape in the direction of advancement of the yarn, parallel to the direction of advancement Z.

[00103] Preferably, moreover, the suction table 22 comprises a pair of channelling walls 38, projecting from the main surface 30, between which the auxiliary belt 24 is visibly positioned i.e. without a plate attached to the suction table 22.

[00104] Moreover, according to a further embodiment, the tensioner 46 for the auxiliary belt 24 comprises at

least one bush 146, for example bronze, on which the auxiliary belt 24 moves, and a rod 148, on which the bush 146 is mounted loosely. The rod 148 is adjustable in height, so as to forcibly tension the auxiliary belt 24.

[00105] According to a further embodiment, the end tang 62 and the suction table 22 are made in one piece and such single component is applied to the respective intermediate duct 60.

[00106] According to yet a further embodiment, the transmission unit 200 comprises the idle transmission roller 202, supported by the stem 204 cushioned, for example by means of an elastic element, and connected to the support 206 for attachment to the frame of the spinning machine by means of an engagement lever 207, to which the stem 204 is hinged, and in turn hinged to the support 206.

[00107] In particular, the hinge axis J1 between the support 206 and the stem 204 is parallel and distanced in relation to the hinge axis J2 between the stem and the lever 207, so that the rotation of the lever 207, usually manual, entails an immediate lifting or lowering of the transmission roller 202.

[00108] When the engagement lever 207 is lowered, the transmission roller 202 is in contact with the auxiliary cylinder 14a and with a motorised cylinder, for example a

drawing cylinder, preferably in a cushioned manner; when the engagement lever 207 is lifted, the transmission roller 202 is disengaged from the auxiliary cylinder 14a.

[00109] Moreover, according to yet a further embodiment, the drive means comprise a transmission group 400 suitable for transmitting a rotational movement from a motorised cylinder to the auxiliary cylinder 14a, for example from a drawing cylinder, for example from the first drawing cylinder of the first pair of drawing cylinders, to the auxiliary cylinder 14a by means of gears.

[00110] For example, the transmission group 400 comprises a first toothed wheel 402, coaxial to the first drawing cylinder and integral therewith in rotation, a second toothed wheel 404, suitable to mesh with the first toothed wheel 402, and an auxiliary wheel 406, coaxial to the auxiliary cylinder 14a and integral therewith in rotation and suitable to mesh with the second toothed wheel 404.

[00111] Preferably, the transmission group 400 further comprises a gear box 410, crossed by the motorised cylinder, for example by the first drawing cylinder 4a, and engaged with the auxiliary cylinder 14a and containing the toothed wheels 402, 404, 406 in an oil bath.

[00112] According to a preferred embodiment, several transmission groups are provided 400.

[00113] For example, in a short spinning machine, two transmission groups are provided 400, one positioned at one end of the auxiliary cylinder 14a and the other at the other end of the auxiliary cylinder 14a.

[00114] In a further example, such as a long spinning machine, in which the first drawing cylinder 14a comprises axially aligned and separate sections, and likewise the auxiliary cylinder 14a, a transmission group 400 is provided at each end of the sections of the auxiliary cylinder 14a. For example, in a spinning machine in which the first drawing cylinder 14a is separated into two axially aligned sections, the auxiliary cylinder 14a also is separated into two axially aligned sections and four transmission groups 400 are provided.

[00115] Moreover, according to a preferred embodiment, the drive assembly 250 comprises a pair of supports 17a, 17b provided with respective seats for housing a portion of the auxiliary cylinder 14a; in particular, said supports 17a, 17b are fork-shaped to enable the rapid removal of the auxiliary cylinder 14a.

[00116] For example, the seats of said supports 17a, 17b are suitable for housing the rolling bearings 15a,

15b placed at the ends of the auxiliary cylinder 14a.

[00117] In other words, according to this embodiment, the auxiliary cylinder 14a is removable.

Claims

1. Device (20) for compacting a yarn (W1), comprising:
 - a first pair of cylinders comprising a lower cylinder (4a) and a pressure cylinder (4b) in pressure contact therewith;
 - an auxiliary pair of cylinders comprising an auxiliary cylinder (14a) and a pressure cylinder (14b) in pressure contact therewith, said auxiliary pair being downstream of said first pair of cylinders;
 - a suction table (22), positioned between the first pair of cylinders and the auxiliary pair of cylinders, provided with a suction aperture (34) connectable to suction means suitable for generating an aspirated air flow from the suction aperture (34);
 - an auxiliary belt (24) permeable to the air, wound around the auxiliary cylinder (14a) and the suction table (22) to form a closed path and passing over the suction aperture (34) of the suction table (22), on which the fibre yarn (W1) destined for compacting is positioned.
2. Device according to claim 1, wherein the auxiliary pair of cylinders (14a, 14b) has a peripheral speed of rotation less than that of the first pair of cylinders (4a, 4b).
3. Device according to claim 1 or 2, wherein the portions of the auxiliary cylinder (14a) in contact with the

auxiliary belt (24) are smooth.

4. Device according to any of the previous claims, wherein the suction aperture (34) has an elongated shape parallel to the direction of advancement (Z) of the yarn.

5. Device according to any of the previous claims, wherein the suction table (22) comprises a pair of channelling walls (38), projecting from a main surface (30), between which the auxiliary belt 24 is positioned in sight.

6. Device according to any of the previous claims, comprising a tensioner (46) for the auxiliary belt (24) comprising at least one bush (146) on which the auxiliary belt (24) moves, and a rod (148) on which the bush is loosely mounted (146), adjustable in height, so as to forcibly tension said belt.

7. Device according to any of the previous claims, comprising a transmission group (400) suitable for the transmission of the rotational movement from the first drawing cylinder (4a) to the auxiliary cylinder (14a) by means of at least one gear.

8. Device according to claim 7, wherein transmission groups (400) are provided at each end of the auxiliary cylinder (14a).

9. Device according to any of the previous claims, comprising a pair of supports (17a, 17b) suitable to

support the auxiliary cylinder (14a) in a removable manner.

10. Device according to any of the previous claims, wherein the lower cylinder (4a) is motorised and the auxiliary cylinder (14a) is driven by the lower cylinder (4a).

11. Compacting assembly of a fibre yarn (W1) comprising:

- a first pair of cylinders comprising a lower cylinder (4a) and a pressure cylinder (4b) in pressure contact therewith;

- an air suction compacting device (20) comprising an auxiliary pair of cylinders comprising an auxiliary cylinder (14a) and a pressure cylinder (14b) in pressure contact therewith, said auxiliary pair being downstream of said first pair of cylinders;

- gear drive means for moving the auxiliary cylinder (14a) by means of the lower cylinder (4a).

12. Spinning machine comprising:

- a lower cylinder and a plurality of pressure cylinders (4b) in pressure contact therewith;

- a plurality of coaxial auxiliary cylinders (14a), downstream of the lower cylinder (4a), and a plurality of pressure cylinders (14b) in pressure contact with the auxiliary cylinders (14a);

- a plurality of modular suction groups (50) for the

pneumatic compacting of fibre yarns (W1), each modular group (50) comprising at least a suction table (22) having a suction aperture (34) connectable to suction means and a respective auxiliary belt (24) permeable to air, wound around the respective auxiliary cylinder (14a) and the respective suction table (22) and passing over the respective suction aperture (34);

wherein the auxiliary cylinders (14a) are axially separate for the fitting of replacement auxiliary belts (24) for maintenance operations.

13. Spinning machine comprising:

- a lower cylinder and a plurality of pressure cylinders (4b) in pressure contact therewith;

- a plurality of auxiliary cylinders (14a), downstream of the lower cylinder (4a), coaxial to each other and a plurality of pressure cylinders (14b) in pressure contact with the auxiliary cylinders (14a);

- a plurality of modular suction groups (50) for the pneumatic compacting of fibre yarns (W1), each modular group (50) comprising at least a suction table (22) having a suction aperture (34);

- a suction apparatus (300) connected to the modular units (50) to obtain a flow of aspirated air from the main apertures (34);

wherein the suction unit (300) comprises

a) a single main collecting duct (308), engaged with a fan;

b) a plurality of secondary collecting ducts (304) connected to the main collecting duct (308);

c) a plurality of end suction ducts (302), each coupled to the relative modular group (50);

and wherein each secondary collecting duct (304) is connected to a sub-group of said end suction ducts (302).

14. Spinning machine according to claim 13, wherein each secondary collecting duct (304) is closed at one end by a plug (306) which can be opened to clean the secondary duct (304).

15. Spinning machine according to claim 13 or 14, wherein the main collecting duct (308) is provided with a plug (310) at one end, which can be opened to clean the main duct (308).

16. Spinning machine according to any of the claims from 13 to 16, wherein the suction apparatus (300) comprises a single fan operatively connected for suction with the main collecting duct (308).

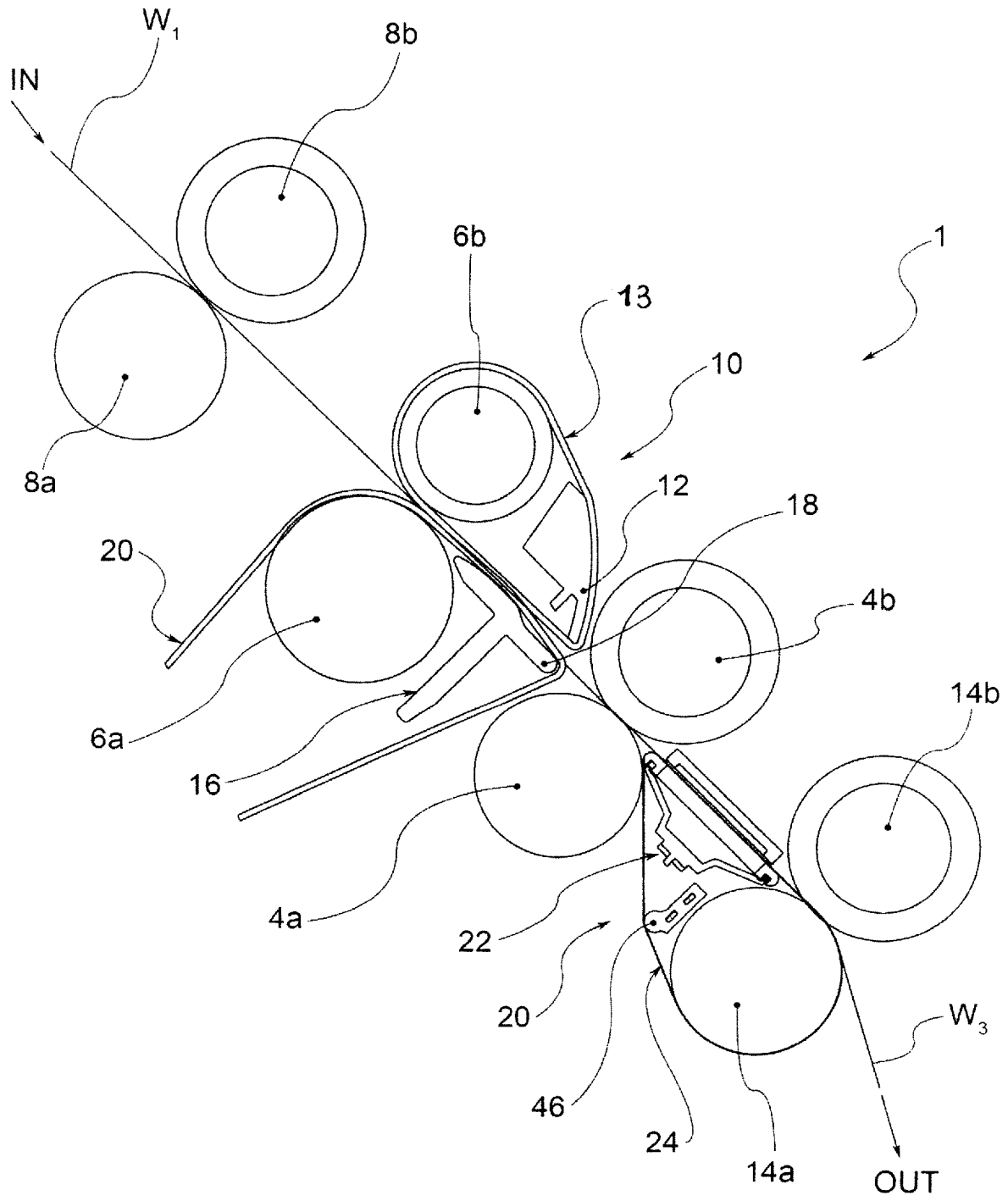


Fig. 1

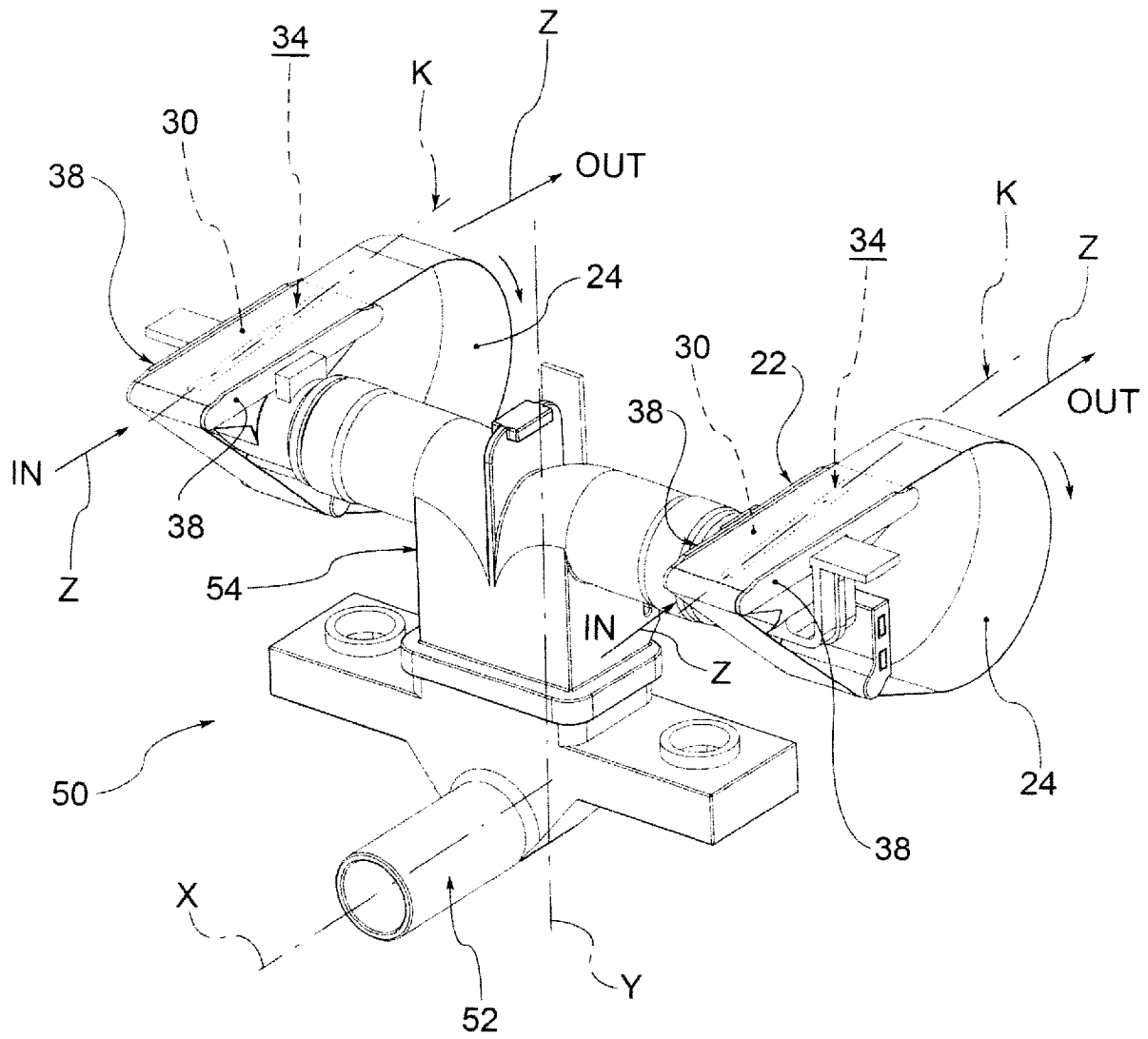


Fig. 2

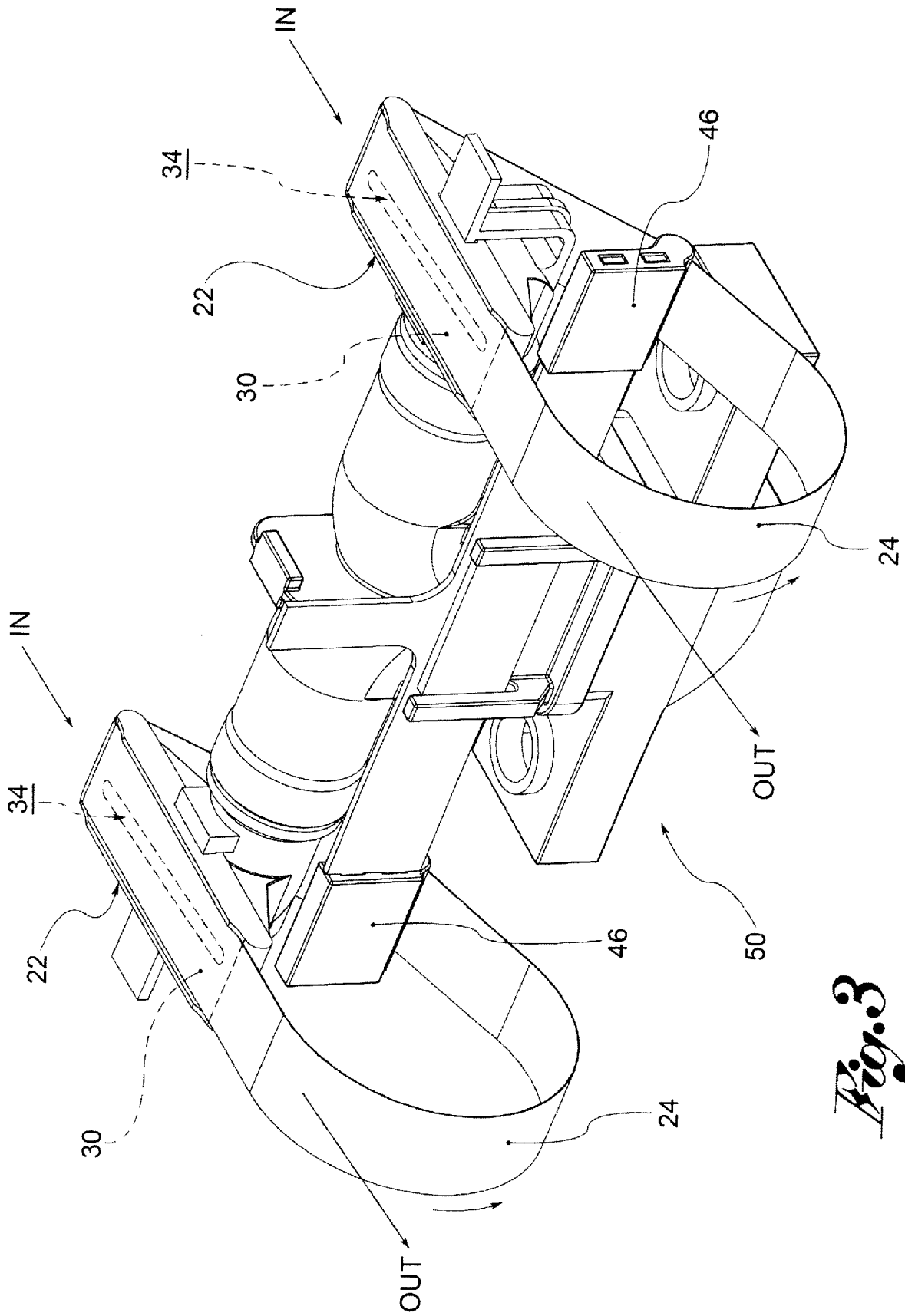


Fig. 3

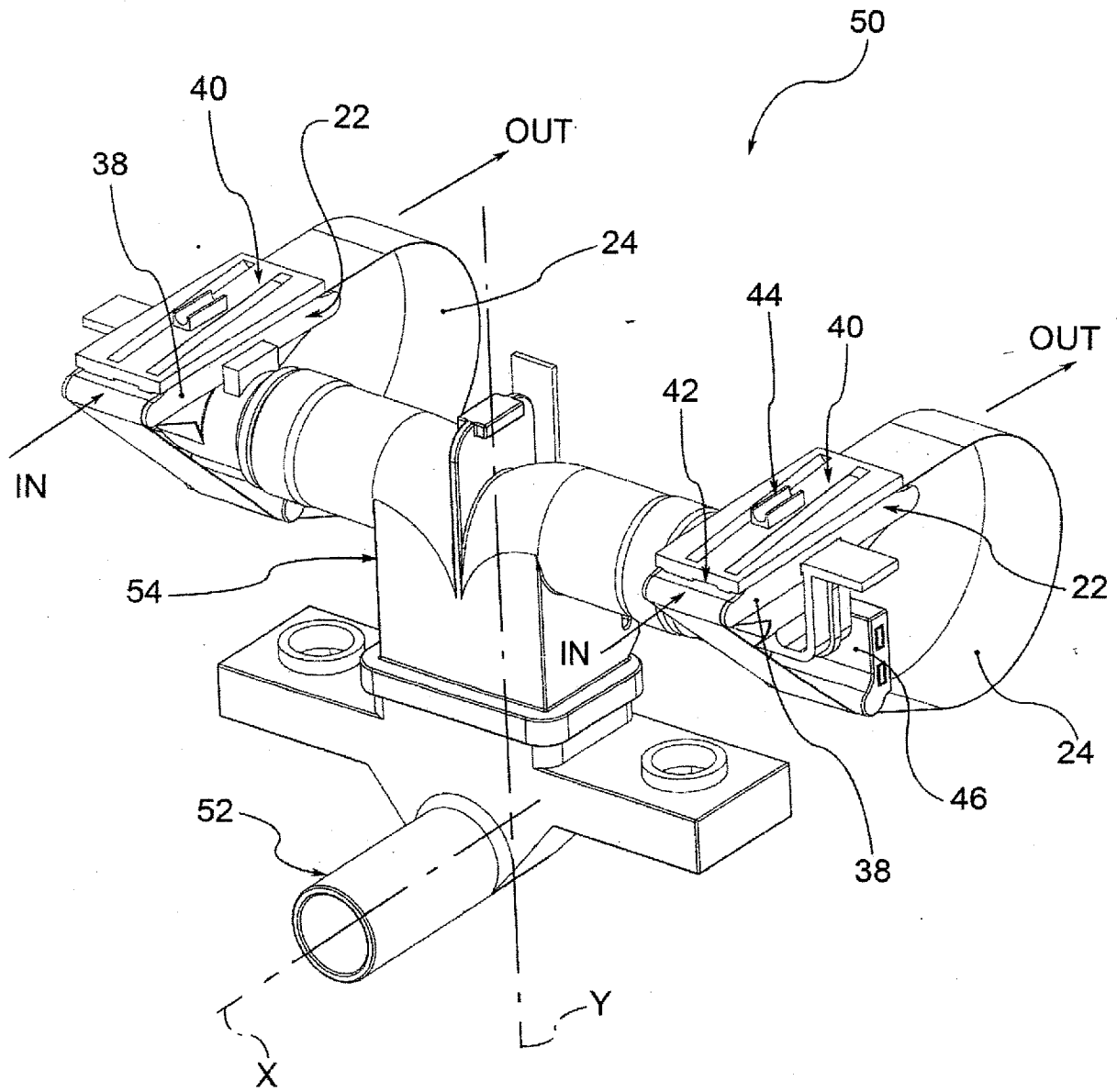


Fig. 4

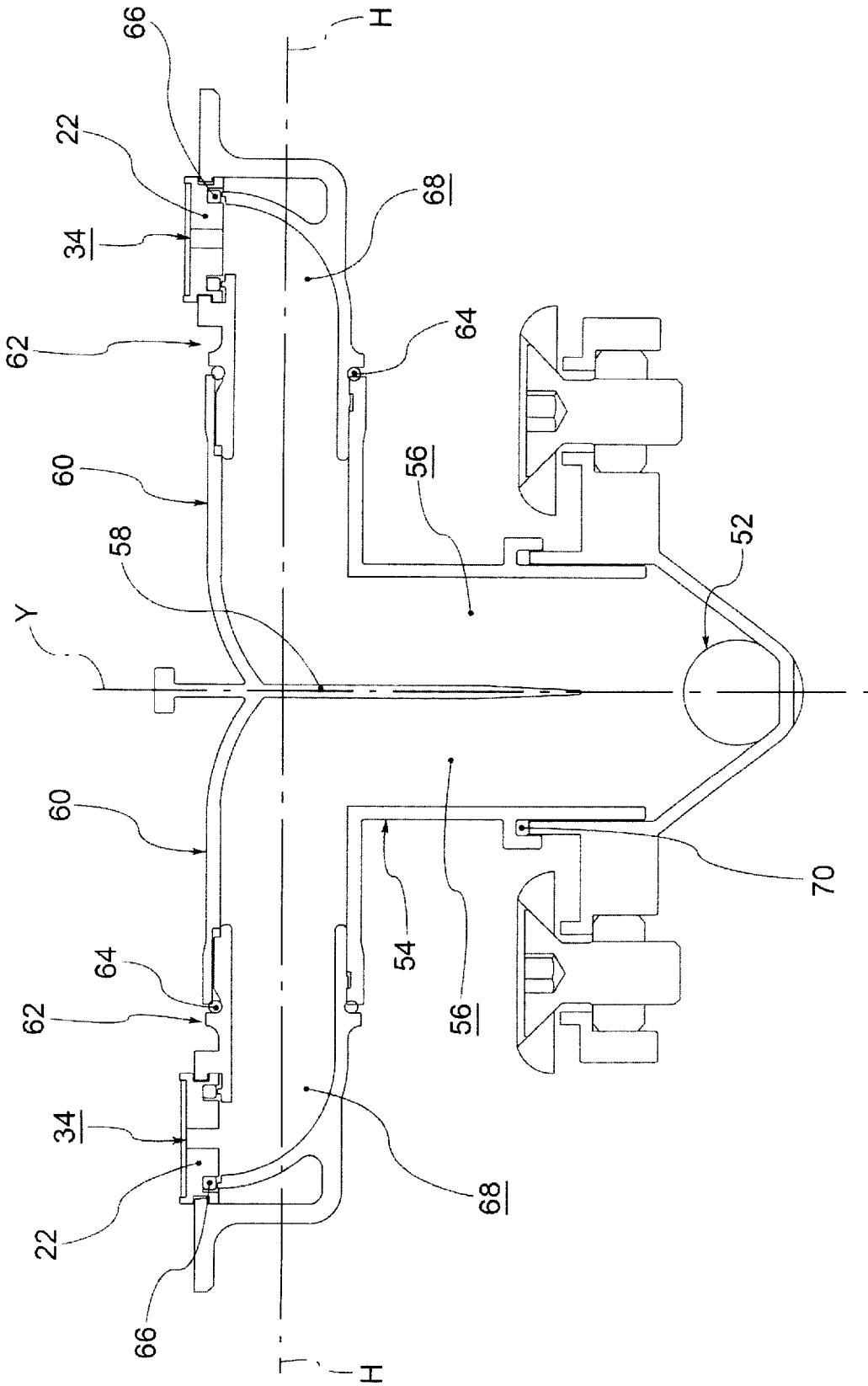


Fig. 5

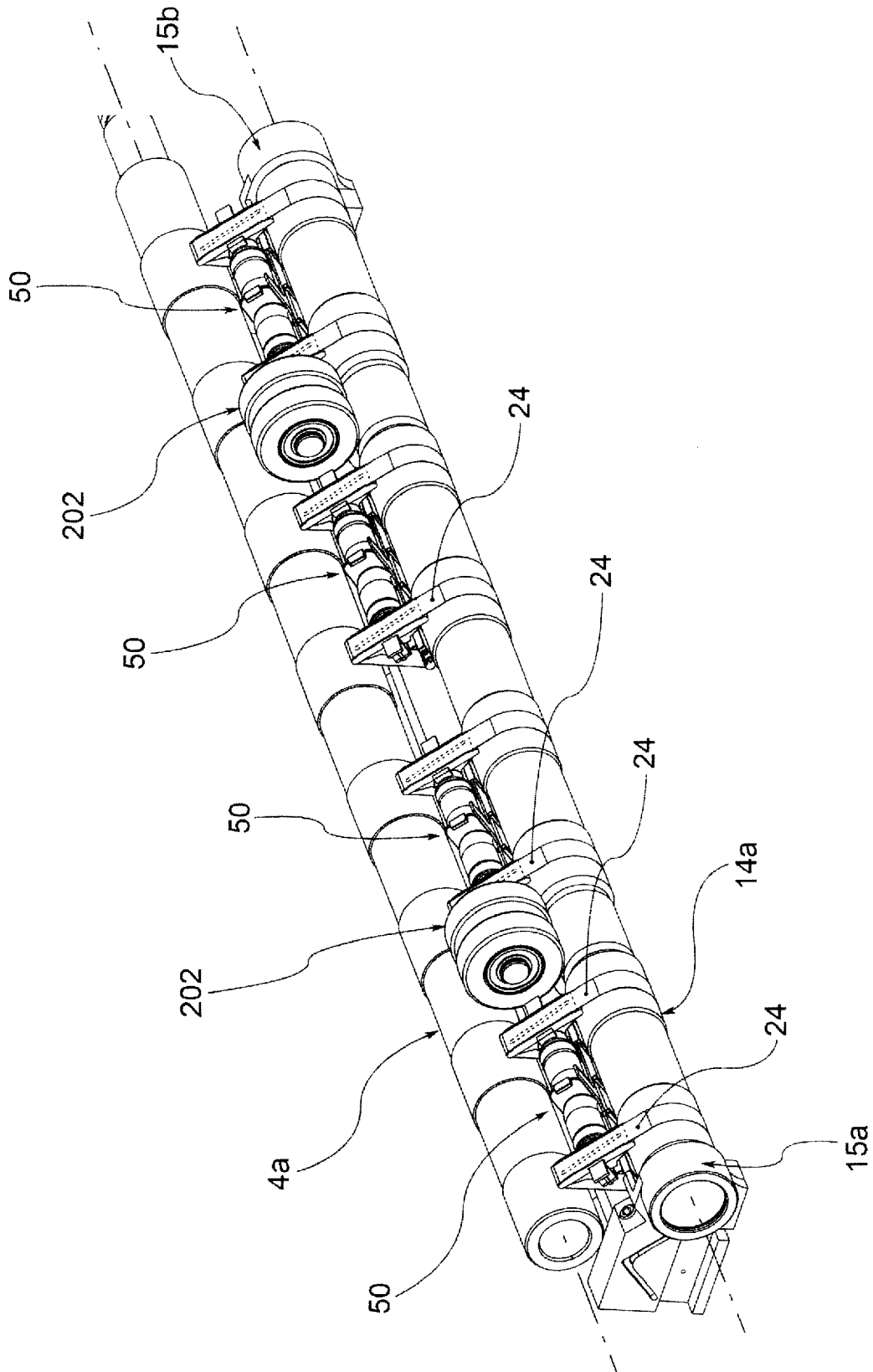


Fig. 6

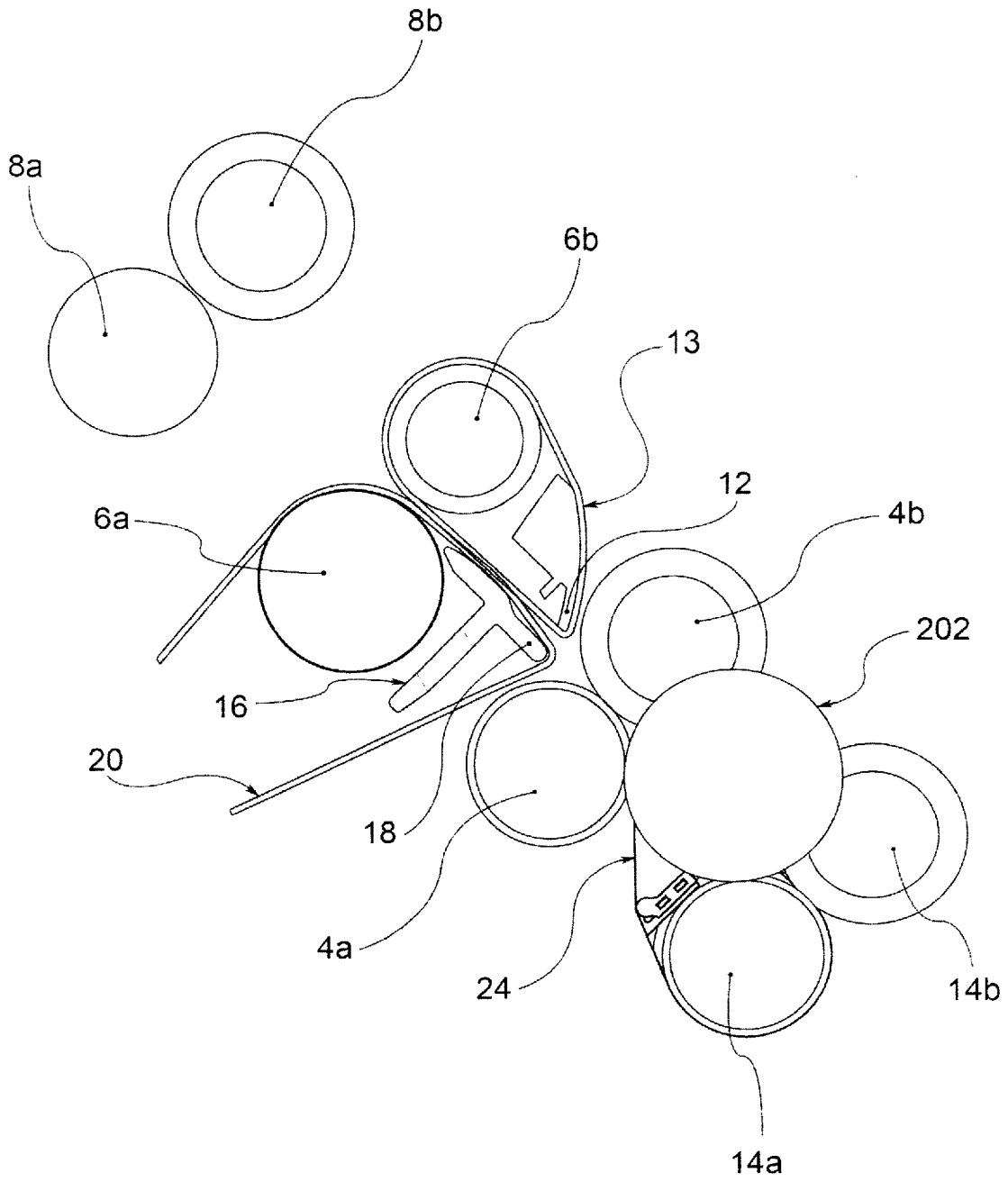


Fig. 7

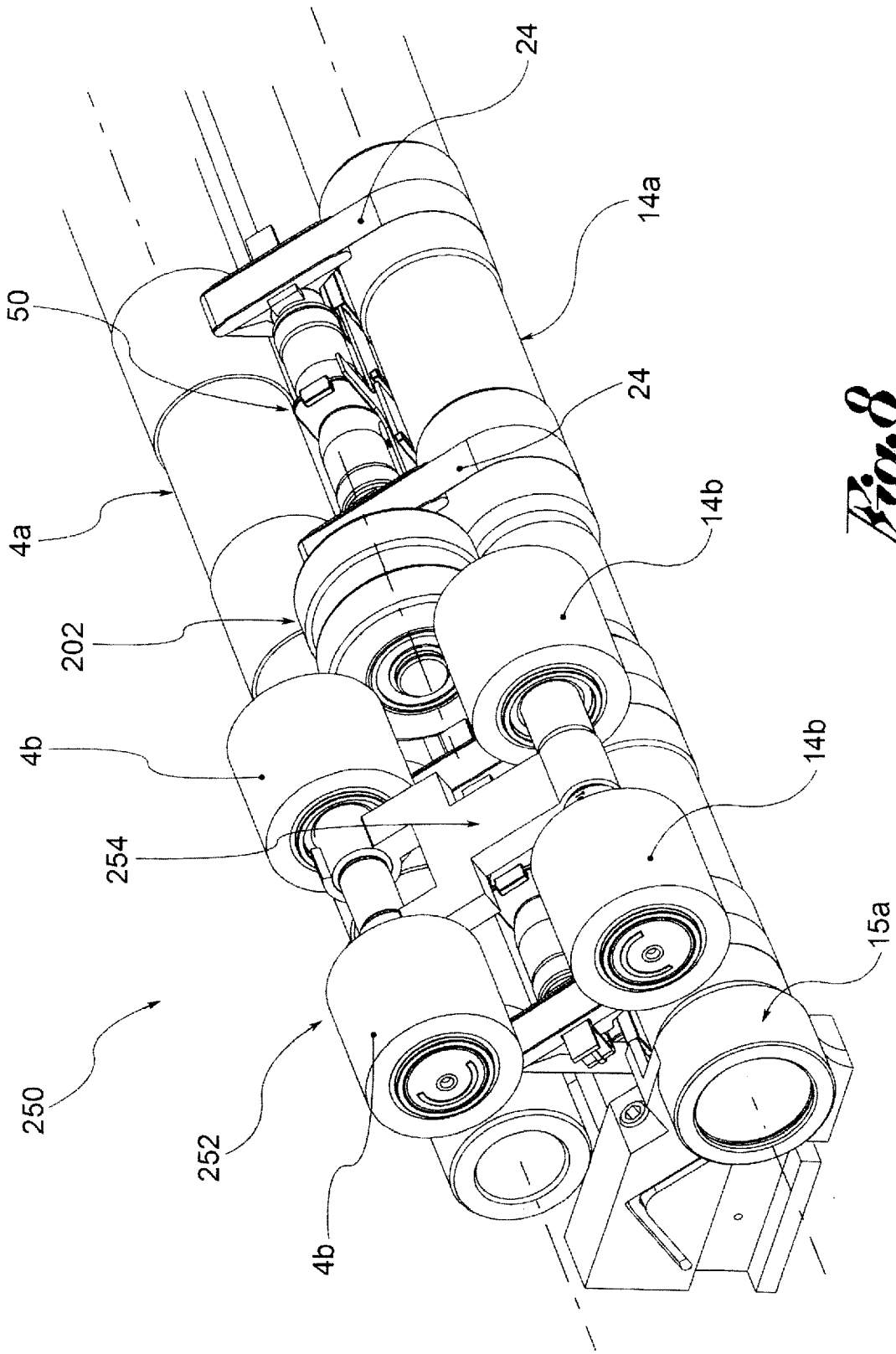


Fig. 8

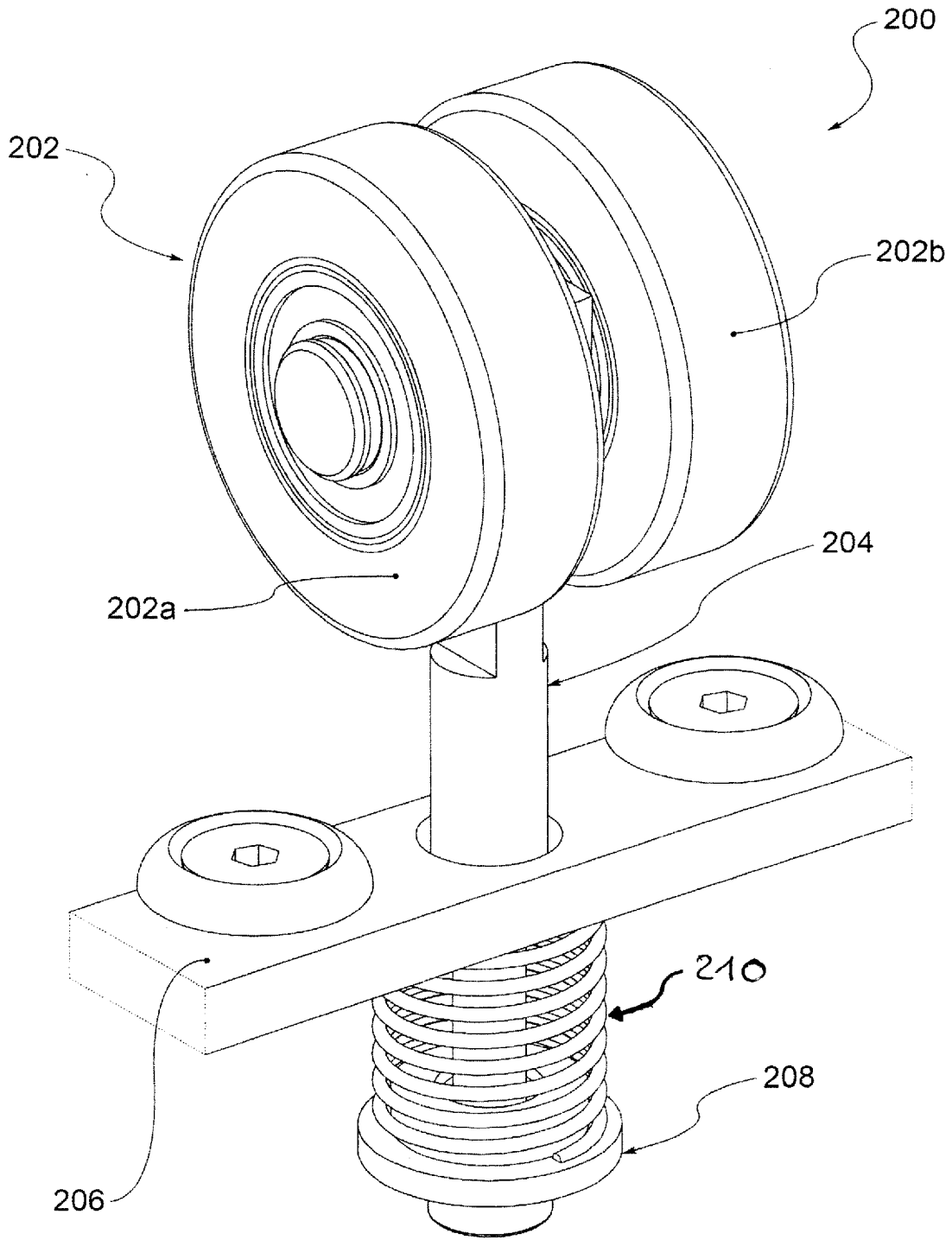


Fig. 9

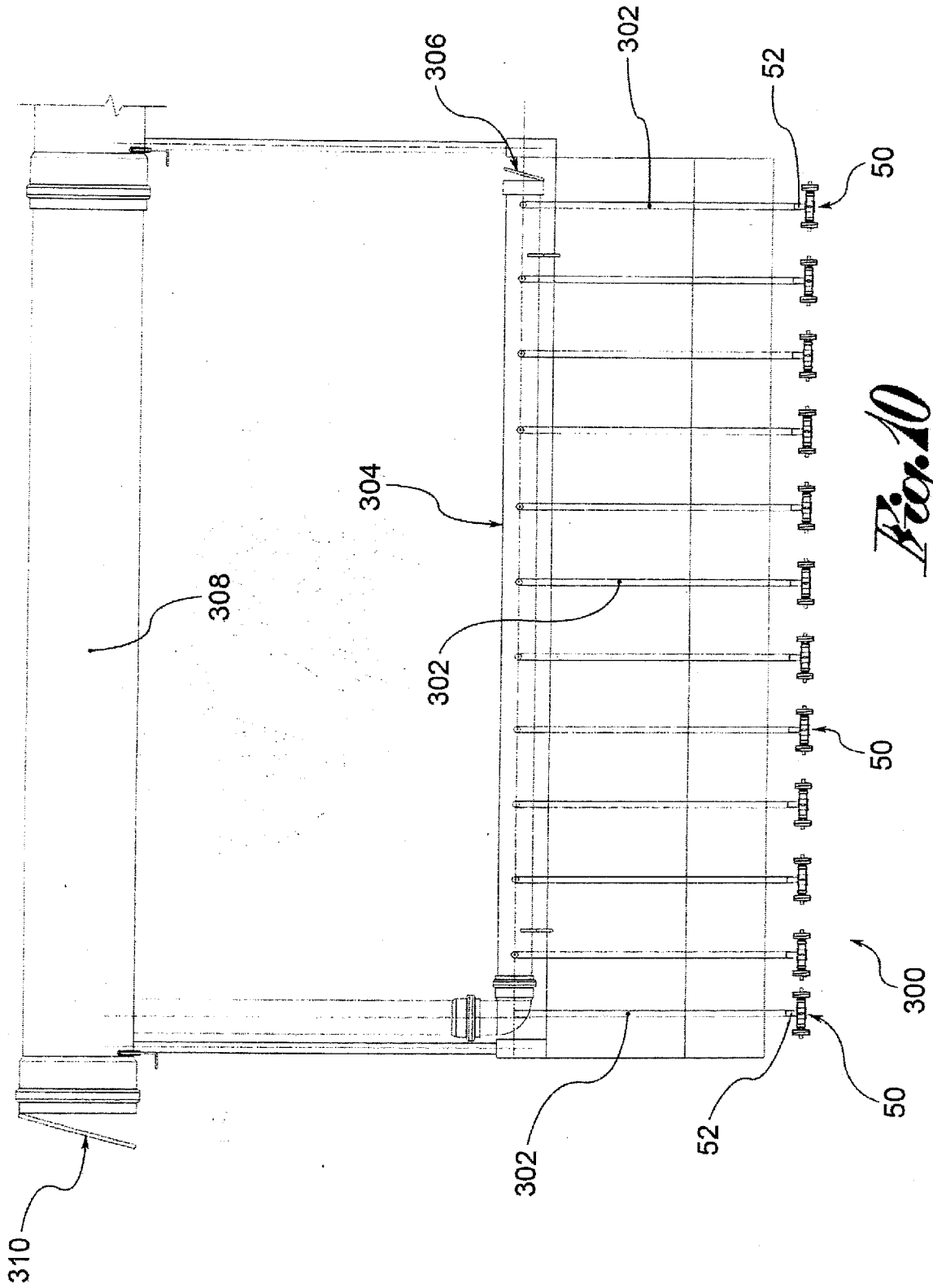


Fig. 10

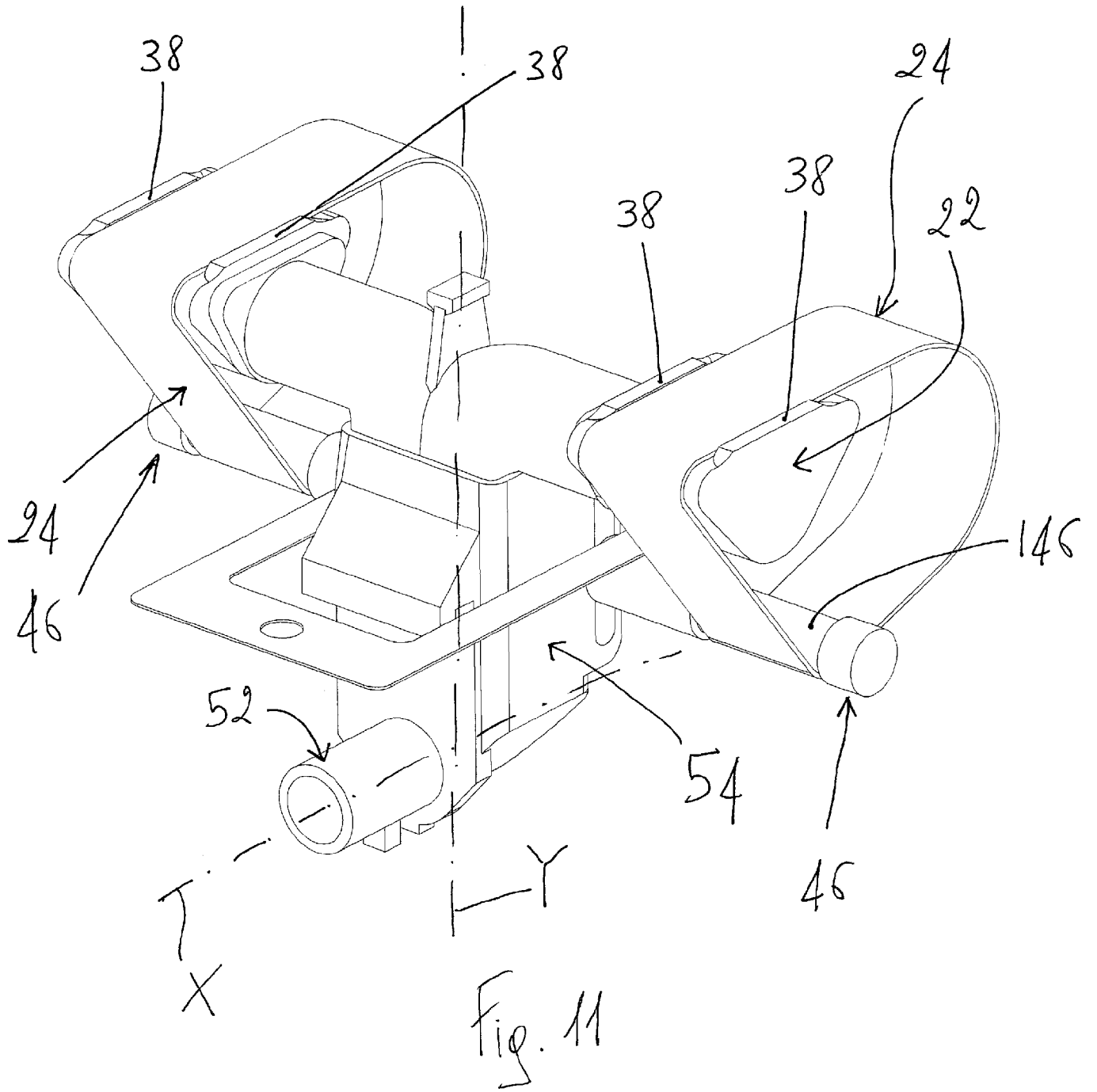


Fig. 11

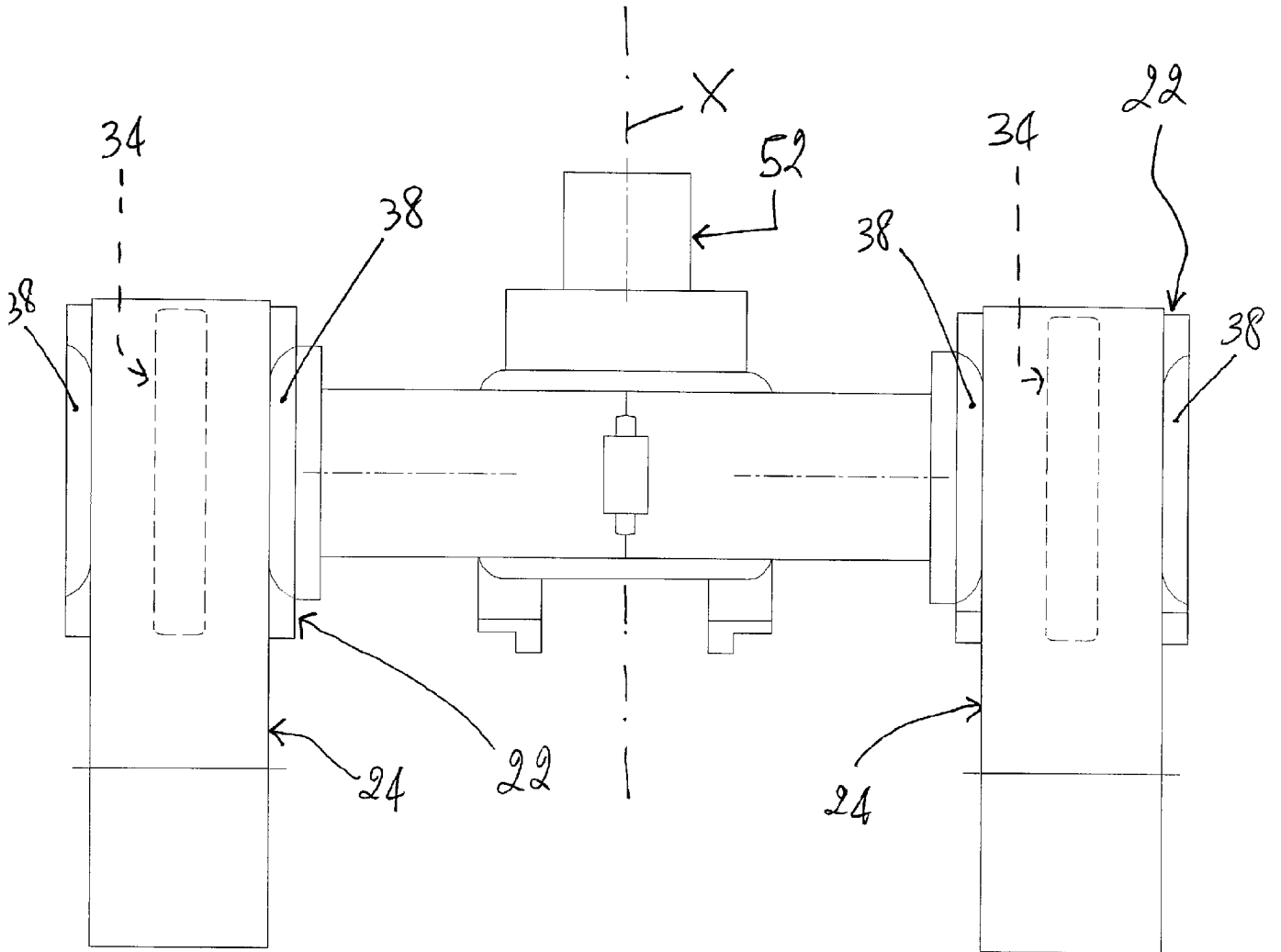
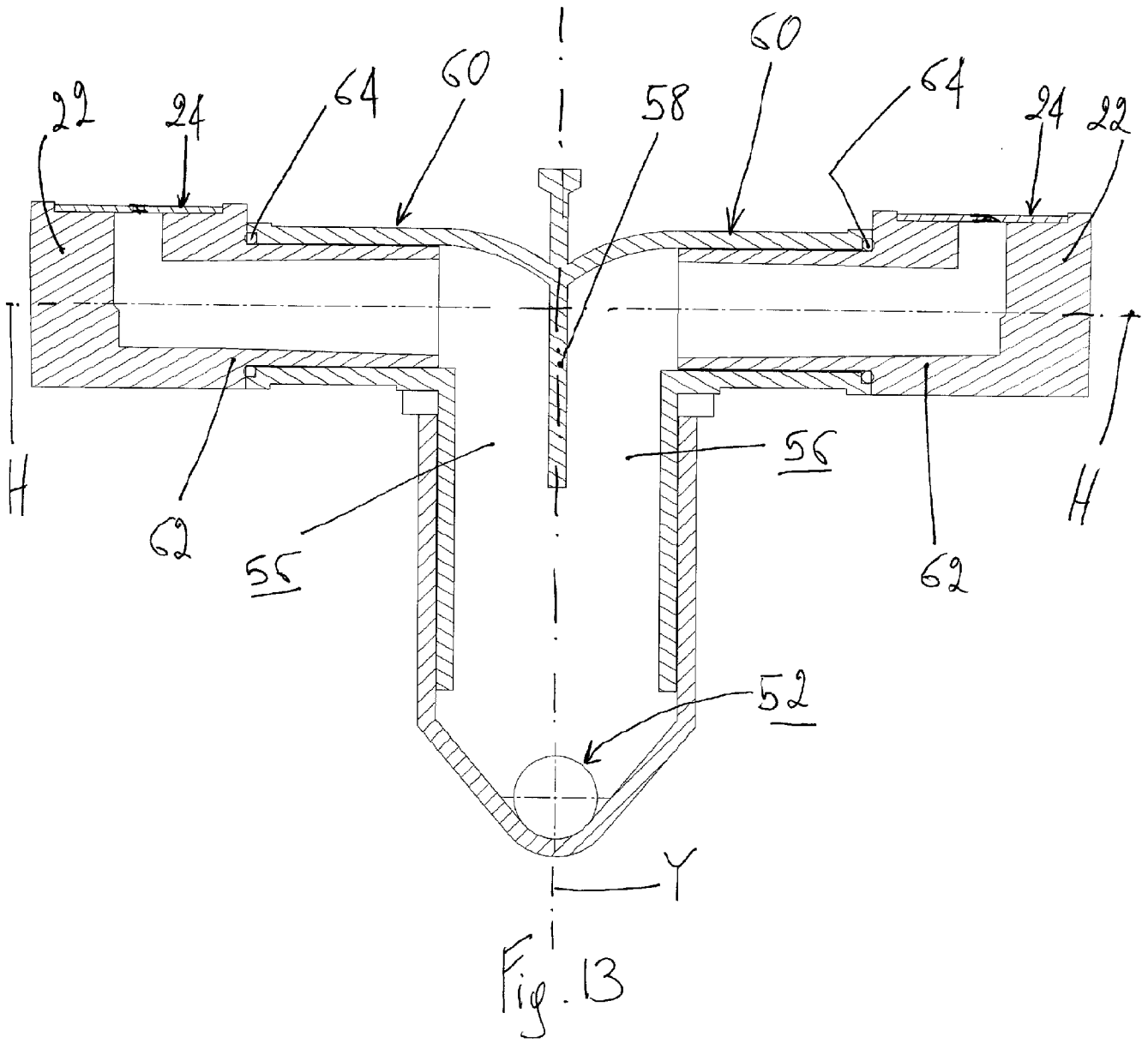


Fig. 12



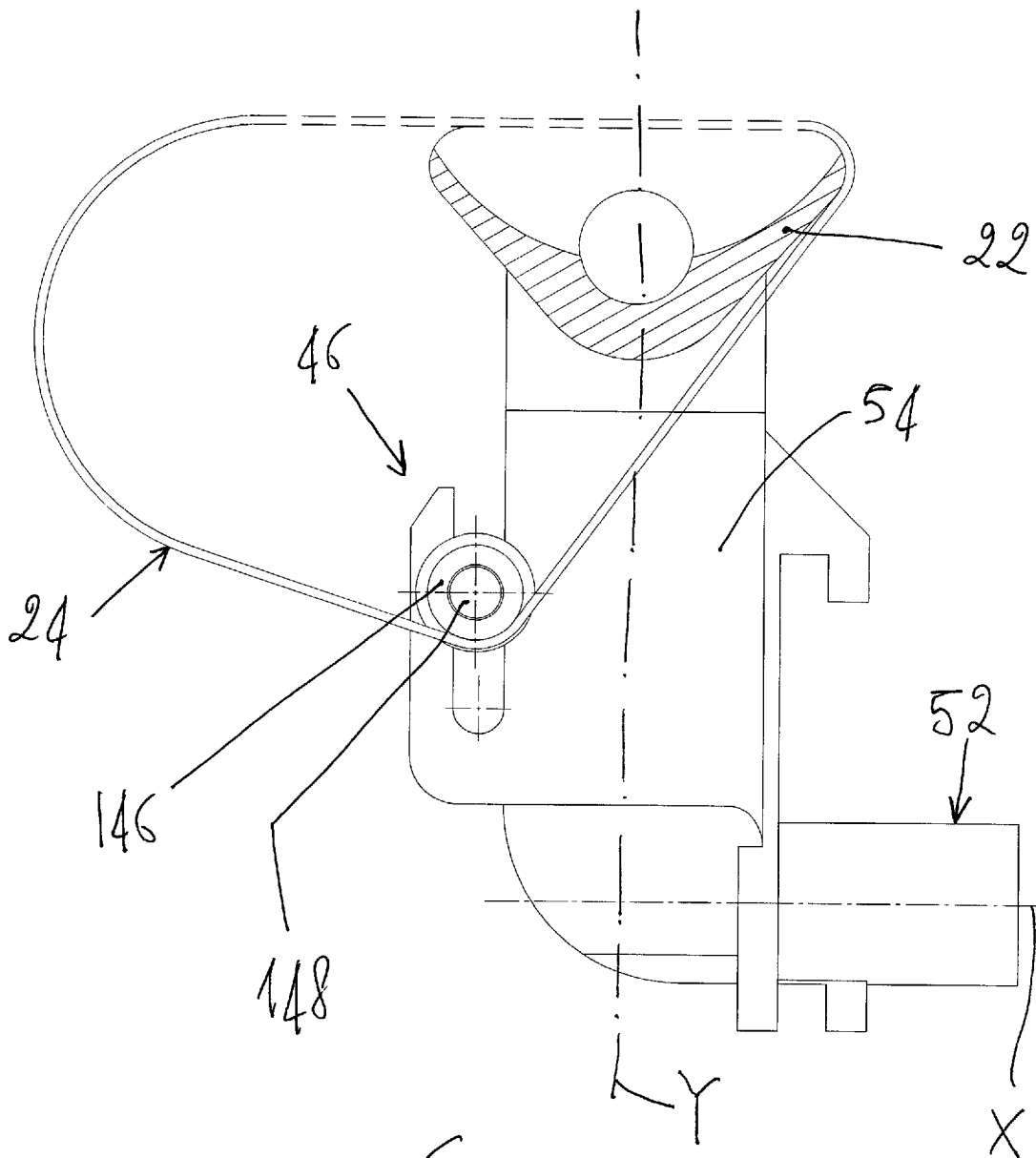


Fig. 14

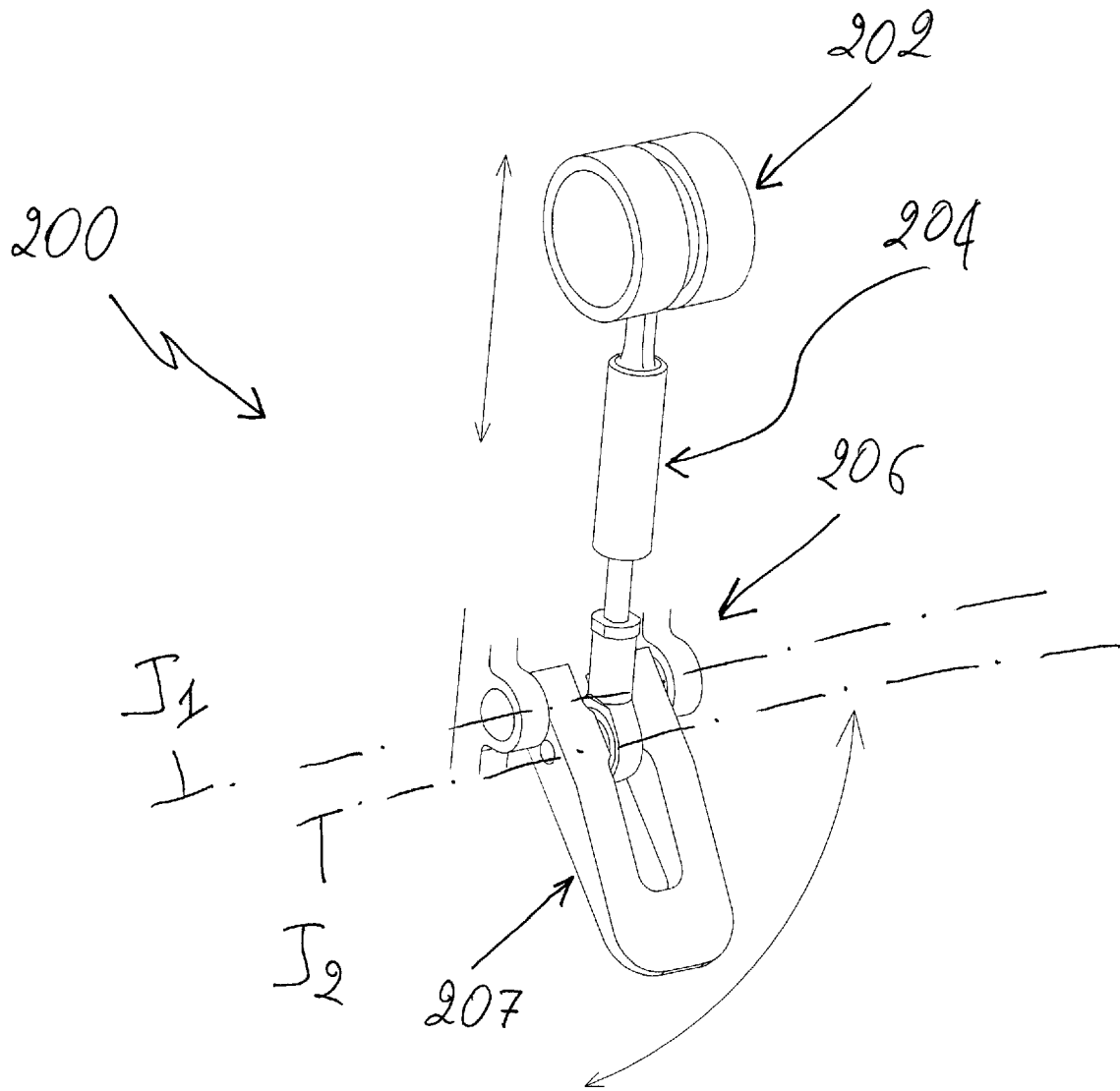


Fig. 15

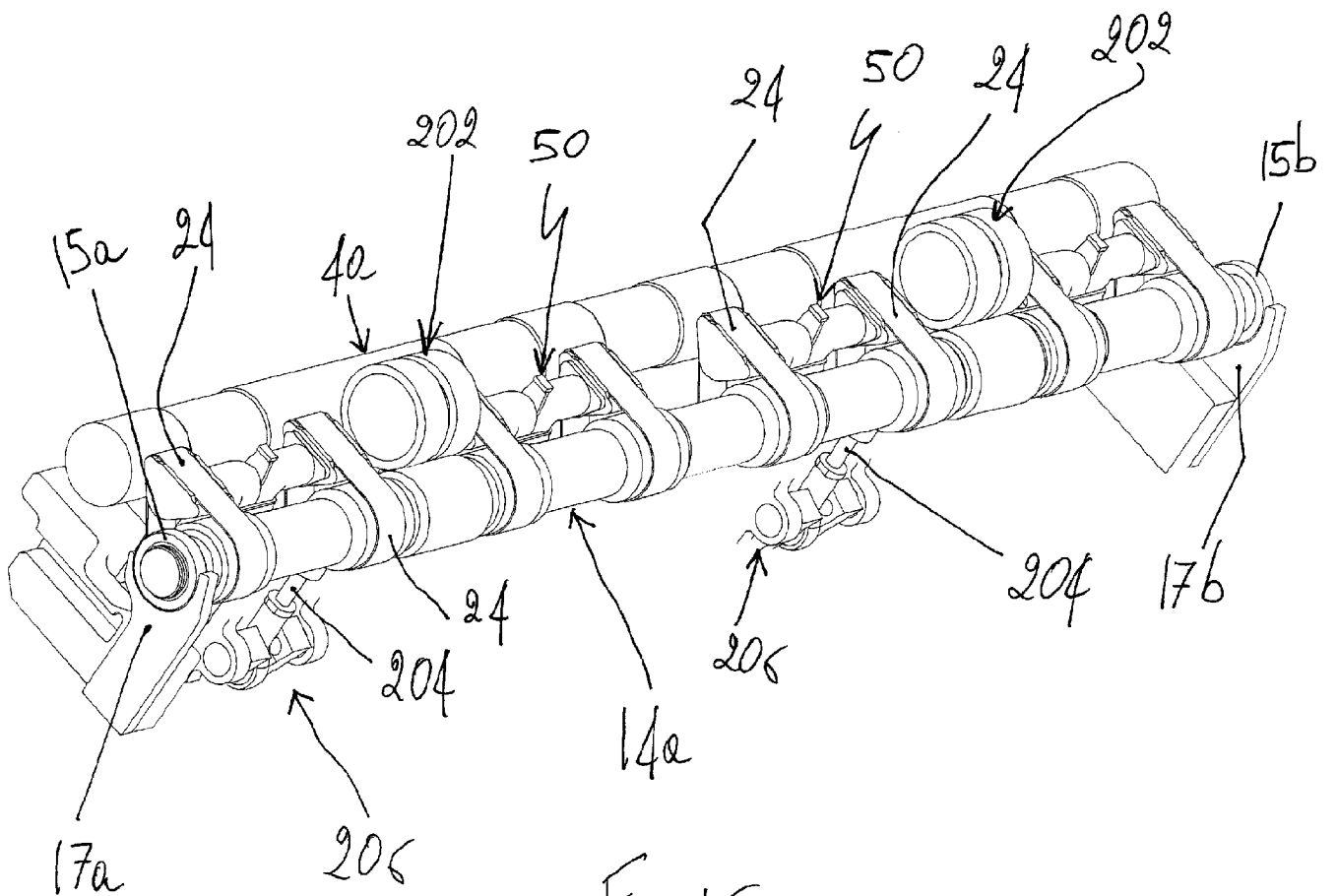
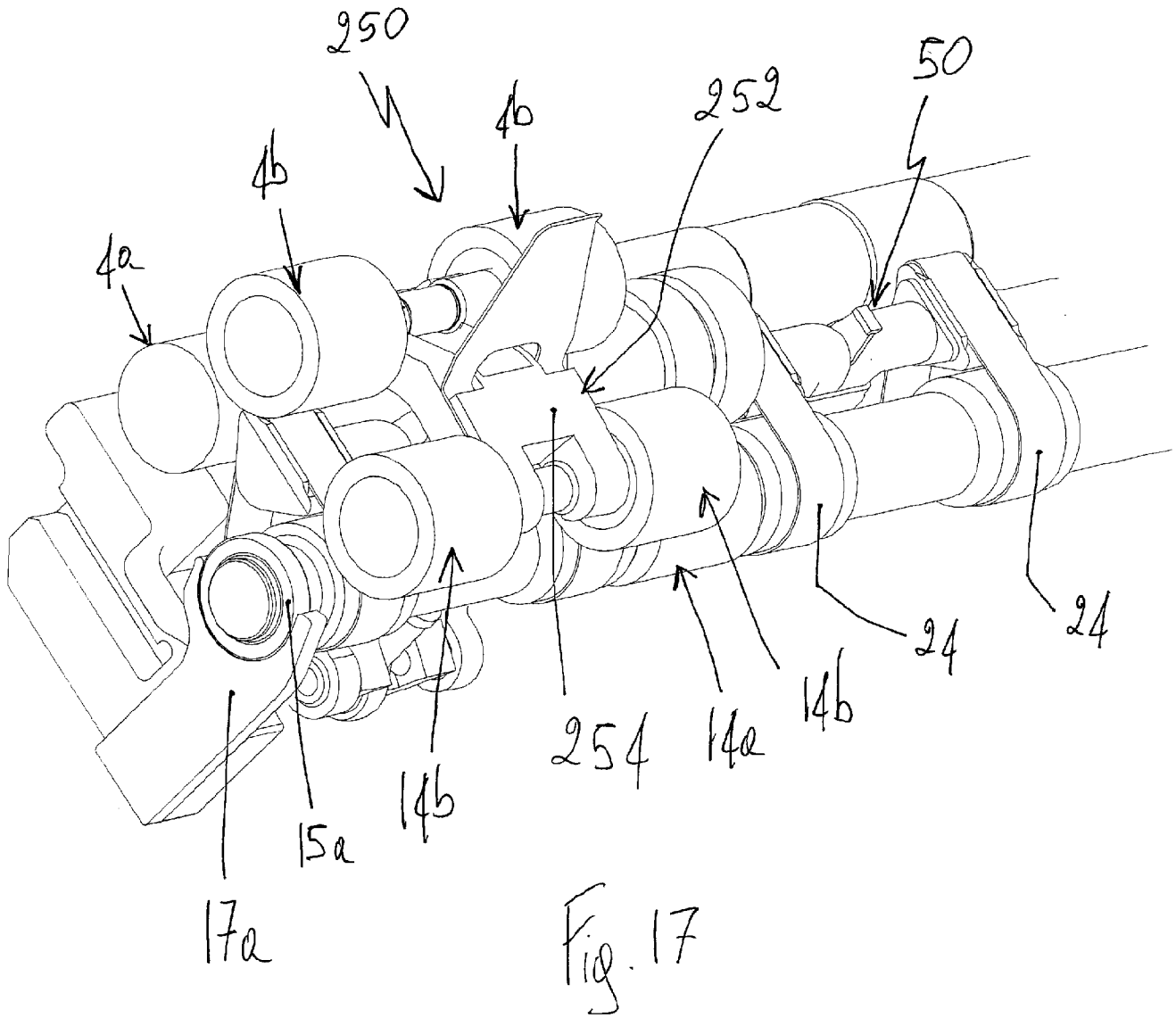


Fig. 16



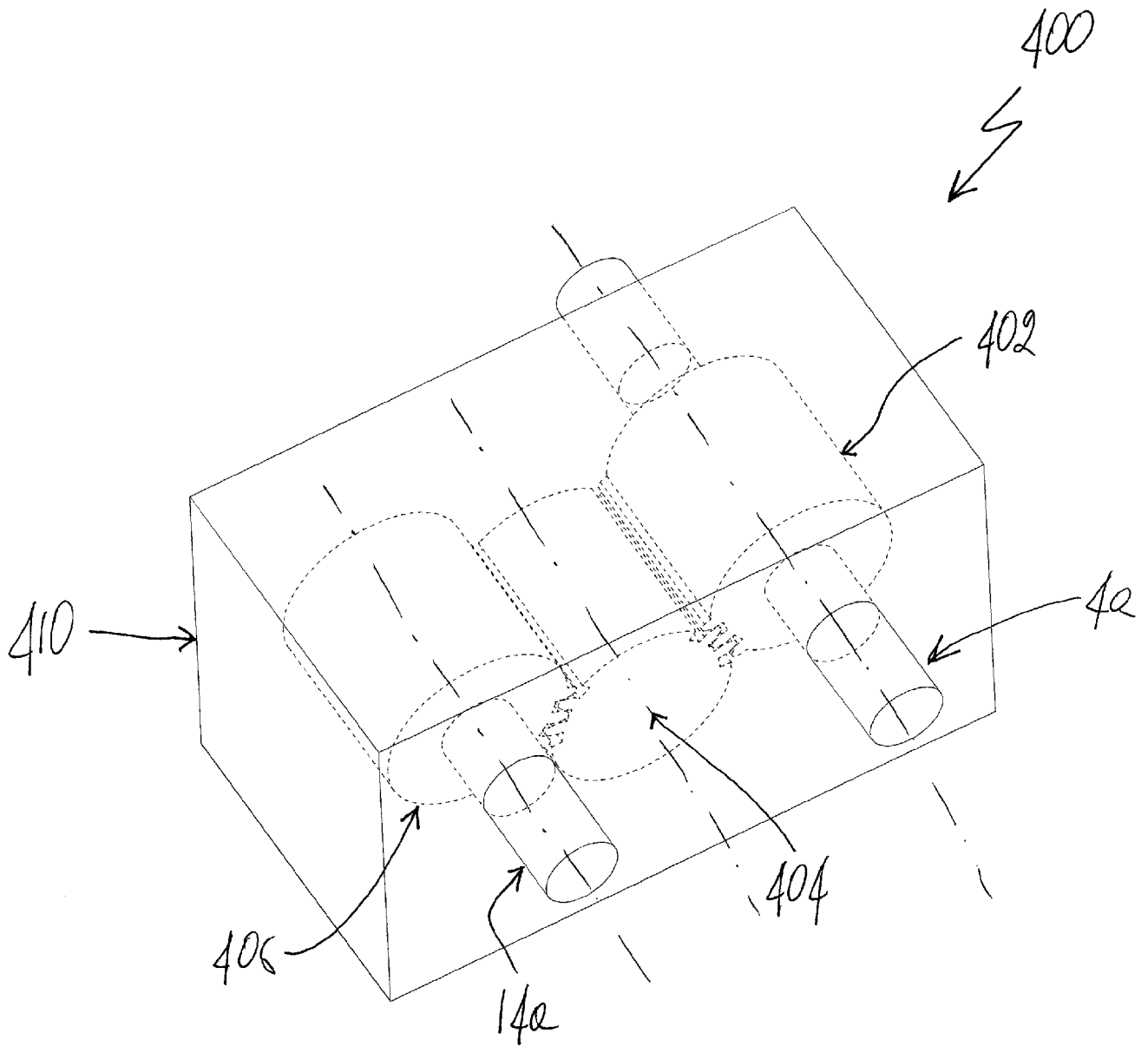


Fig. 18