



(11)

EP 1 696 058 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.08.2006 Bulletin 2006/35

(51) Int Cl.:
D01H 1/38 (2006.01)

(21) Application number: **06114231.1**

(22) Date of filing: **13.05.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR MK YU

(72) Inventors:
• **LOCATELLI, Claudio**
25031, Capriolo (Brescia) (IT)
• **BAITELLI, Giovanni**
25036, Palazzolo sull'Oglio (Brescia) (IT)

(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
03425305.4 / 1 477 594

(74) Representative: **Crippa, Paolo Ernesto**
JACOBACCI & PARTNERS S.p.A.
Piazzale Arnaldo, 2
25121 Brescia (IT)

(71) Applicant: **MARZOLI S.p.A.**
25036 Palazzolo Sull'Oglio,
Brescia (IT)

Remarks:

This application was filed on 19 - 05 - 2006 as a
divisional application to the application mentioned
under INID code 62.

(54) Device for gripping the underwinding yarn for a ring spinning frame

(57) A device for gripping the underwinding yarn for a ring spinning frame comprises a collar (14) fixed to the spindle (2), a sleeve (24) able to slide axially and a bar (40) supported by a pair of pneumatic actuators.

The support axis (Z-Z) of the bar (40), defined by the points where the bar is supported by the actuators (70a,70b), intersects the active portions (42) of the bar (40) that engage with the sleeve (24) in order to stiffen the bar (40), and simultaneously open the sleeves (24) of the spindles of the spinning frame.

The engagement portions (70a,70b) of the bar (40) that engage with the actuators are longitudinally separated from its active portions (42) in order to make the spinning frame compact and make the presence of the actuators compatible with the wharves (10) of the spindles (2) and with the drive means by which they are turned.

The bar (40) moves vertically in order to engage/disengage the spindle (2).

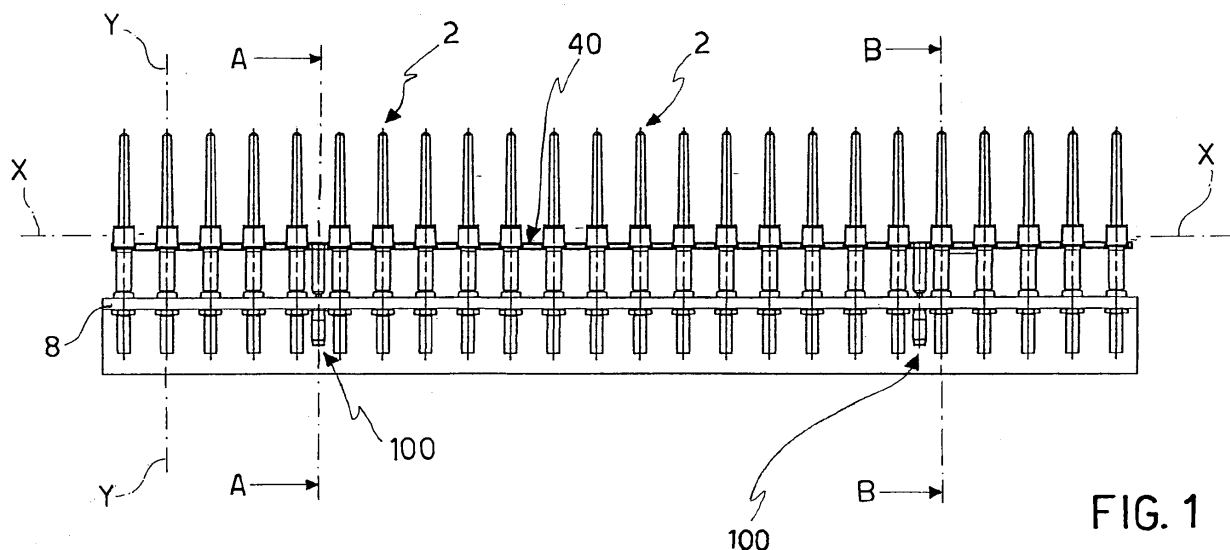


FIG. 1

Description

[0001] The present invention relates to a device for gripping the underwinding yarn for a ring spinning frame.

[0002] Spinning lines of modern design show a strong tendency to automation of the processes, leading to faster processing times and sporadic intervention of staff specializing in the operation of the machines.

[0003] In particular, in the case of spinning frames, there is an established trend to automating the doffing of the bobbins from the spinning frame and replacing them with empty tubes placed on the spindles for winding-on, that is for forming new bobbins.

[0004] When the winding of the bobbins is finished, the spinning frame is stopped. The bobbins are connected to the yarn arriving from the spinning frame's draft unit and passing through the traveller of the ring rail.

[0005] The bobbins are removed from the spindles by machines specially designed for the operation and known as doffers. The bobbin is separated from the yarn by tearing the yarn. Once an empty tube has been put on, the spinning frame is started up again to form a new bobbin.

[0006] In order to carry out this process automatically, gripping devices have been designed to grip a reserve length of yarn, so that when the rotation of the spindles and the movement of the rail are started up again, the yarn winds onto the empty tube and forms a new bobbin.

[0007] Examples of gripping devices constructed as above are disclosed in documents EP-A1-462467, EP-A1-775769, DE-19816205-A1 and CH 290235.

[0008] However, the prior-art solutions have thrown up problems especially in the construction of suitable means capable of efficiently controlling the opening and/or closing of the gripping devices, principally in the case of spinning frames running a large number of spindles.

[0009] The prior-art solutions are often inefficient at simultaneously opening and/or closing the gripping devices associated with the spindles, or have gripping device control means for each spindle, which militates against the constructional simplicity of the spinning frame against its production cost and in terms of maintenance problems.

[0010] The problem addressed by the present invention is that of devising a gripping device that will have structural and functional features such as to fulfil the abovementioned requirements and at the same time obviate the problems outlined above.

[0011] This problem is solved in the form of a gripping device in accordance with Claim 1 and with Claim 10. The claims dependent on these respective claims describe variants.

[0012] The features and advantages of the gripping device according to the present invention will be clear from the following description of a preferred embodiment thereof. This is given by way of non-restrictive indication, with reference to the accompanying figures, in which:

[0013] Figure 1 is a longitudinal schematic view of a series of spindles of a spinning frame comprising a gripping device according to the present invention;

[0014] Figure 2 is a partially sectioned view of a spindle from Figure 1, taken on section plane A-A, in which the gripping device is in a closed configuration;

[0015] Figure 3 is a partially sectioned view of a spindle from Figure 1, taken on section plane B-B, in which the gripping device is in a closed configuration;

[0016] Figure 4 is a partially sectioned view of a spindle from Figure 1, taken on section plane A-A, in which the gripping device is in an open configuration;

[0017] Figure 5 is a partially sectioned view of a spindle from Figure 1, taken on section plane B-B, in which the gripping device is in an open configuration;

[0018] Figures 6a and 6b show a bar belonging to the gripping device of Figure 1, in plan view and side view respectively;

[0019] Figure 7 is an enlarged detail of the bar from Figure 6a, and

[0020] Figures 8a to 8c show cross sections of the bar from Figure 7, taken on section planes C-C, D-D and F-F, respectively, from Figure 7.

[0021] With reference to the appended figures, the number 1 is a general reference for a spinning frame for forming bobbins which will then be sent on for subsequent processing.

[0022] The spinning frame 1 comprises a plurality of spindles 2 arranged along a longitudinal axis X-X of the spinning frame.

[0023] Each spindle 2 extends along a vertical axis of rotation Y-Y, about which the spindle is rotated in order to wind up the yarn onto the tube placed on the said spindle.

[0024] The spindle 2 has a connecting portion 4 attached by connecting means 6, such as a captive nut system, to the structure 8 of the spinning frame.

[0025] In addition, the said spindle 2 has a portion, known as a wharf 10, acted upon by drive means 12 capable of rotating the spindle 2 about the vertical axis Y-Y.

[0026] Also, the spindle 2 has a collar 14 fixed to the said spindle.

[0027] In a preferred embodiment, the collar 14 is coaxial with the spindle and comprises a bush 16 from where there

projects, at the top end 16a of the bush, an annular projection 18.

[0028] The said annular projection 18 is provided, in a preferred embodiment, with a shaped portion 20. On a horizontal plane passing through the said annular projection 18 and perpendicular to the vertical axis Y-Y of the spindle, the said shaped portion 20 exhibits a toothed, preferably triangular profile.

[0029] The spindle 2 also includes a sleeve 24 which is coupled in rotation to the said spindle and able to slide along the said vertical axis of rotation Y-Y.

[0030] In a preferred embodiment, the sleeve 24 has, at a lower end 24a, a ring 26 projecting radially from the tubular element of the said sleeve.

[0031] Additionally, the said sleeve is provided, at its top end 24b, with an opposing shaped portion 28.

[0032] On a cylindrical surface, coaxial with the spindle 2 and passing through the said opposing shaped portion 28, the said opposing shaped portion 28 has a toothed, preferably triangular profile.

[0033] The sleeve 24 is permanently urged towards and against the said collar 14.

[0034] In other words, the top end 24b of the said sleeve 24 is permanently urged towards and against the collar 14.

[0035] In particular, a stop ring 30 is connected to the bush 16 of the fixed collar 14 and supports a cylindrical distance piece 32. A spring 34 is compressed between the said distance piece 32 and an internal annular projection 36 of the sleeve 24, formed at the top end 24b of the latter.

[0036] The said spring 34 permanently urges the sleeve 24 so that it is held against the collar 14.

[0037] The sleeve 24 of the spindle 2 engages with a bar 40 that extends along the said longitudinal axis X-X of the spinning frame 1.

[0038] In particular, the said bar 40 has at least one active portion 42 that engages with the said sleeve 24 of the spindle 2.

[0039] In a preferred embodiment, the said bar 40 has a cross section, formed by a plane perpendicular to the longitudinal axis X-X of the spinning frame, that is closed.

[0040] In another embodiment, the said bar 40 comprises a C-shaped portion 43a and a strip 43b, connected to the open side of the C-shaped portion 43a, to form the said closed section.

[0041] For the bar 40, a longitudinal centre plane M-M is defined at right angles to the visible surface of the said bar, for example at right angles to the visible surface of the C-shaped portion 43a.

[0042] Furthermore, the said bar 40 has, along the longitudinal axis X-X, at least one opening 60 passing through the said C-shaped portion 43a and the said strip 43b, the said opening being designed to fit the said bar to each spindle 2 of the spinning frame 1.

[0043] The opening 60 is designed to engage the bar 40 with the sleeve 24. For example, with reference to the embodiment described, the said opening 60, produced by a visible hole 62a through the C-shaped portion 43a of the bar 40 and a corresponding lower hole 62b through the strip 43b, has a diameter of the visible hole 62a that is smaller than the outside diameter of the ring 26 of the sleeve 24.

[0044] For translational movement along the direction of the vertical axis Y-Y of the bar 40, for example in the downward direction, that is in the direction indicated by the arrow D, the active portion 42 of the bar 40 comes into contact with the ring 26 of the sleeve 24, bringing about a downward translational movement of the said sleeve.

[0045] In other words, the said active portion 42 of the bar 40 is defined by the zone of contact between the sleeve 24 and the said bar 40 which causes the sleeve to move downwards.

[0046] The bar 40 also has at least one engagement portion 64, designed to engage with drive means 100 for moving the said bar in the direction of the vertical axis Y-Y.

[0047] In other words the said engagement portion 64 is designed to transmit to the bar 40 the translational movement in the direction of the vertical axis Y-Y produced by the said drive means 100.

[0048] At least one of the said engagement portions 64 of the bar engaging with the said drive means 100 for its translational movement is separated longitudinally from at least one of the said active portions 42 of the bar 40 that engages with the said sleeve 24.

[0049] In a preferred embodiment, the said engagement portions 64 represent bearing points for the said bar, so that the bar 40 is supported at a plurality of bearing points arranged along a support axis Z-Z.

[0050] In a preferred embodiment, the bar 40 is supported at a first bearing point 70a and at a second bearing point 70b, separated along the said support axis Z-Z passing through the two said bearing points, by a length termed the span.

[0051] The said span is preferably 1680 mm long, or, in another embodiment, 1800 mm long.

[0052] In a preferred embodiment, the said bearing points 70a, 70b represent the points at which the said bar is connected to the said drive means 100 for moving the said bar along the direction of the vertical axis Y-Y.

[0053] The support axis Z-Z of the bar 40 intercepts at least one of the said active portions 42 of the bar 40.

[0054] In other words, the bearing points of the bar, for example the points at which it is connected to the drive means 100, define the support axis Z-Z which passes through at least one of the zones designed for contact between the sleeve 24 and the bar 40.

[0055] In a preferred embodiment, the said drive means comprise a pneumatic or hydraulic actuator assembly comprising a cylinder-and-piston device.

[0056] In particular, the said drive means 100 comprise a cylinder 102 acting in combination with a piston 104, connected to the bar 40 by means of a distance piece 106.

[0057] Connection means, preferably comprising a yarned connection, are suitable for connecting the piston 104 to the distance piece 106, the distance piece 106 to the bar 40 and the cylinder 102 to the structure of the spinning frame.

[0058] The piston 104 of the drive means 100 is positioned so that its axis of translational movement T-T is essentially parallel to the vertical axis Y-Y of the spindle 2, so that the said translational movement of the bar 40 occurs in a direction parallel to the said vertical axis Y-Y.

[0059] The said axis of translational movement T-T of the piston 104 lies in the centre plane M-M defined for the bar 40.

[0060] Along the said longitudinal axis X-X of the spinning frame, at least one of the said spindles 2 is positioned at a longitudinal distance from the said drive means 100 for the translational movement of the bar.

[0061] In other words, at least one of the said spindles 2 is positioned at a longitudinal distance from the axis of translational movement T-T of the piston 104.

[0062] Putting it yet another way, along the said longitudinal axis X-X of the spinning frame, the said drive means 100 for the translational movement of the bar 40, which comprise for example the said cylinder-and-piston device, are at a longitudinal distance from the wharf of the spindle in which the said spindle engages with the drive means for turning the spindle.

[0063] The said spinning frame 1 also includes a ring rail 200 connected to drive means (not shown) that give the said rail a reciprocating vertical translational motion.

[0064] Mounted on the rail 200 is a ring 202 that surrounds the spindle 2 and around which a traveller (not shown) rotates.

[0065] In normal operation of the spinning frame 1, in a closed configuration of the gripping device, the piston 104 is in a raised position and the sleeve 24 is pressed by the spring 34 against the collar 14 (Figures 2 and 3).

[0066] Between the top end 24a of the sleeve 24 and the collar 14, i.e. between the shaped portion 20 of the collar and the opposing shaped portion 28 of the sleeve 24, there is wound, preferably about the bush 16 of the said collar 14, the tail end of the yarn arriving from the spinning frame's draft device and passing through the traveller as it rotates around the ring 202 supported by the rail 200, thus forming an initial reserve of yarn.

[0067] An empty tube is placed on the spindle for a new bobbin to be formed. The tube is attached to the body of the spindle by retention means, preferably snap-lock means.

[0068] The spindle is rotated by the drive means 12 which are designed to rotate the spindle about the vertical axis of rotation Y-Y.

[0069] The rail 200 is moved vertically by the rail movement drive means, giving them a reciprocating vertical motion proceeding gradually from the base portion of the spindle near the collar 14, towards the top end thereof.

[0070] The yarn, gripped by the gripping device and guided by the rail traveller, is wound onto the tube and forms a first bobbin.

[0071] The rail 200, which, following its reciprocating translational motion, has reached an upper reversing position close to the top end of the spindle, reverses its direction of motion and proceeds from the said upper reversing position to a lower or end-of-winding position close to the collar 14 and above the said collar.

[0072] When it reaches the lower or end-of-winding position, the bobbin is wound and ready to be doffed.

[0073] The drive means 100 for the translational movement of the bar 40 are actuated: the piston 104 moves along the axis of translational movement T-T from the up position to a down position, carrying the bar downwards (Figures 4 and 5).

[0074] The active portion 42 of the bar 40 engages with the sleeve 24, in particular with the ring 26 of the said sleeve, moving it to a down position and defining an open configuration for the said gripping device.

[0075] The drive means 12 for turning the spindle 2 turn it at a low speed.

[0076] The rail 200 moves beneath the lower or end-of-winding position, that is beneath the axial position of the collar 14. The yarn, guided by the traveller, is placed between the opposing shaped portion 28 of the sleeve 24 and the collar 14, preferably around the bush 16 of the said collar.

[0077] In this operational condition, that is with a length of the yarn in between the opposing shaped portion 28 of the sleeve 24 and the collar 14, the spindle 2 is turned at low speed through an angle of rotation of less than 360°, preferably less than 270°.

[0078] The drive means 100 for the translational movement of the bar 40 are actuated and the piston 104 moves from the down position to the up position.

[0079] The sleeve 24, influenced by the spring 34, moves to the up position and stops against the collar 14, gripping the length of yarn placed between the opposing shaped portion 28 of the sleeve 24 and the collar 14, forming a reserve for the formation of the next bobbin.

[0080] The rotation of the spindles is stopped and the formed bobbin is doffed.

[0081] The formed bobbin has a start, formed by a gripped length of yarn, which forms the reserve of the formed bobbin, and an end, formed by a gripped length of yarn arriving from the spinning frame's draft device, which forms the reserve for a bobbin that has yet to be formed.

[0082] Removing the formed bobbin while the sleeve is closed tears the reserve yarn of the formed bobbin downstream of the point where it is gripped, and, at the same time, tears the reserve yarn of the bobbin to be formed next, upstream of the point where it is gripped.

[0083] In other words, after doffing, the gripping device grips a finite length of yarn which represents the reserve of the doffed bobbin, and a length of yarn arising from the spinning frame's draft device which forms the reserve of the bobbin to be formed next.

[0084] Once an empty tube has been put on, formation of the next bobbin commences as described above owing to the presence of the said reservoir for a bobbin due to be formed next.

[0085] To remove the reserve of the doffed bobbin, the gripping device is preferably opened, by operating the drive means 100 to move the bar 40, in the course of bobbin winding, for example when the rail 200 is near the top end of the spindle or in the top position.

[0086] The opening of the gripping device to expel the reserve belonging to the doffed bobbin is not directly and unambiguously dependent on the speed of rotation of the spindle or on the position of the rail, because the opening of the gripping device to expel the reserve belonging to the doffed bobbin is effected by controlling the drive means 100 for moving the bar.

[0087] The reserve belonging to the doffed bobbin is expelled by the action of centrifugal force.

[0088] This expulsion is not prevented by a complete winding of the reserve on the bush of the collar, for example winding through more than one revolution.

[0089] Unusually, the gripping device according to the invention is found to be efficient in simultaneously opening and/or closing the gripping devices connected to the spindles even though it does not have drive means specifically dedicated to each spindle.

[0090] Advantageously, with the said gripping device, the spinning frame is simpler to construct and less costly, and requires less maintenance.

[0091] Another advantageous aspect is that the bar has bearing points arranged along a support axis that passes through the active portions, thus stiffening the said bar so that it is able to lower the sleeves connected to the various spindles more or less simultaneously.

[0092] Advantageously too, the engagement portions of the bar that engage with the drive means used for its translational movement are separated longitudinally on the active portions that engage with the sleeves, making the spinning frame compact in its structure and avoiding the structural complexities that would be due to the sharing of the spaces available between the drive means for moving the bar, and the drive means for rotating the spindles.

[0093] Another advantageous aspect is that the release of the reserve belonging to the doffed bobbin occurs when the rail is raised, limiting the risk of the said reserve spoiling the newly forming yarn.

[0094] It will be obvious that a person skilled in the art will be able to make numerous modifications and alterations to the gripping device described above in order to meet any specific requirements which may arise.

[0095] For example, in one variant, the bar has more than two bearing points.

[0096] In other variant, the drive means for the translational movement of the bar comprise electric motors.

[0097] In yet another variant, the bar has a two-way connection to the sleeve so that the sleeve is returned to the closed configuration of the gripping device by the actuation of the said drive means for translational movement of the bar.

[0098] It will be clear that other variants also are to be understood as coming within the scope of protection of the invention as defined by the following claims.

Claims

1. Device for gripping an underwinding yarn for a ring spinning frame, the said spinning frame comprising a plurality of spindles (2) arranged along a longitudinal axis (X-X) of the spinning frame (1), each spindle (2) extending along a vertical axis of rotation (Y-Y);
the said gripping device comprising:

a collar (14) fixed to the said spindle (2);

a sleeve (24), coupled in rotation to the said spindle (2) and able to slide along the said axis of rotation (Y-Y); and
a bar (40) having at least one active portion (42) engaging with the said sleeve (24) of the spindle (2), the said bar (40) being able to move the said device from a closed configuration, in which the said sleeve (24) is in an up position to grip the underwinding yarn between the said collar (14) and the said sleeve (24), to an open configuration, in which the said sleeve (24) is in a down position to release the underwinding yarn;

drive means (100) for moving the said bar so that the gripping device is open/closed, the said drive means (100) engaging with the said bar (40) in at least one engagement portion (64) of the said bar (40);

in which at least one of the said engagement portions (64) of the bar (40) that engage with the said drive means (100) is longitudinally separated from at least one of the said active portions (42) of the bar (40) that engages with the said sleeve (24) of the device

said device being **characterized in that**

said drive means (100) are suitable for moving the said bar (40) along the direction of the vertical axis (Y-Y).

2. Gripping device according to Claim 1, in which the said bar (40) is supported at a plurality of bearing points (70a, 70b) arranged along a support axis (z-z).

3. Gripping device according to Claim 2, in which a first bearing point (70a) and a second bearing point (70b) are separated by a length termed the span, the said span is preferably 1680 mm long or 1800 mm long.

4. Gripping device according to Claim 2 or 3, in which the said support axis (Z-Z) of the bar (40) intersects at least one of the said active portions (42) of the bar (40).

5. Gripping device according to Claim 2 or 3 or 4, in which the said support axis (Z-Z) of the bar (40) lies in a longitudinal centre plane (M-M) of the said bar (40).

6. Gripping device according to any one of Claims 1 to 5, in which the said bar (40) comprises a visible C-shaped portion (43a).

7. Gripping device according to Claim 6, in which the said bar (40) comprises a strip (43b) which forms, together with the said C-shaped portion, a closed section to the said bar (40).

8. Gripping device according to any one of Claims 1 to 7, in which the said bar (40) comprises along the said longitudinal axis (X-X) of the spinning frame (1) at least one through opening (60) for fitting the said bar (40) to each spindle (2) of the spinning frame (1).

9. Gripping device according to Claim 8, in which the said active portion (42) extends around the said opening (60).

10. Gripping device according to any one of Claims 1 to 9, wherein said drive means (100) comprise a cylinder (102) acting in combination with a piston (104), connected to the bar (40).

11. Gripping device according to Claim 10, wherein the piston (104) is positioned so that its axis of translational movement (T-T) is essentially parallel to the vertical axis (Y-Y) of the spindle (2).

12. Gripping device according to claim 11, wherein the said axis of translational movement (T-T) of the piston (104) lies in the centre plane (M-M) defined for the bar (40) .

13. Gripping device according to any one of Claims 1 to 12, in which the said drive means (100) for the translational movement of the bar (40) comprise a pneumatic actuator (102,104).

14. Gripping device according to any one of Claims 1 to 13, in which every engagement portions (64) of the bar (40) is between two spindles (2).

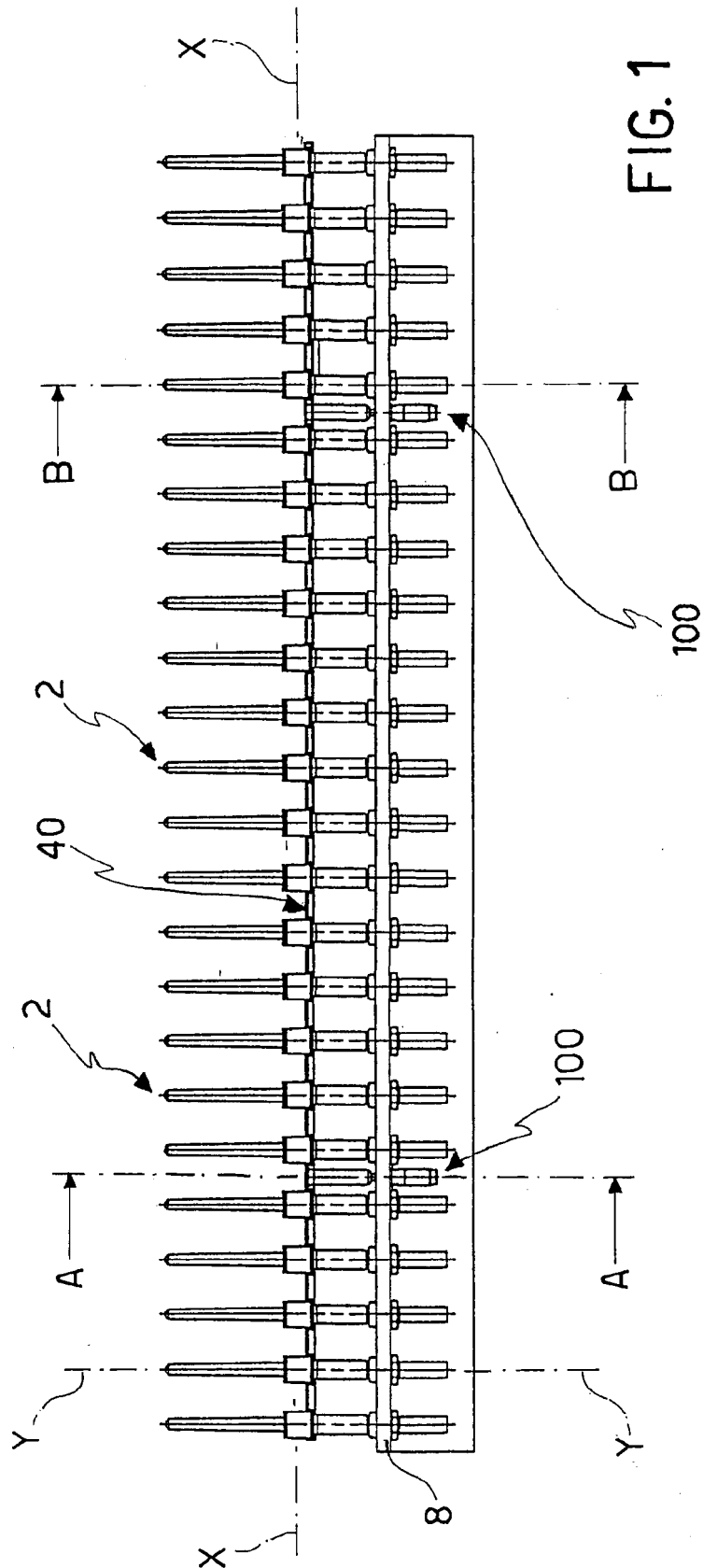
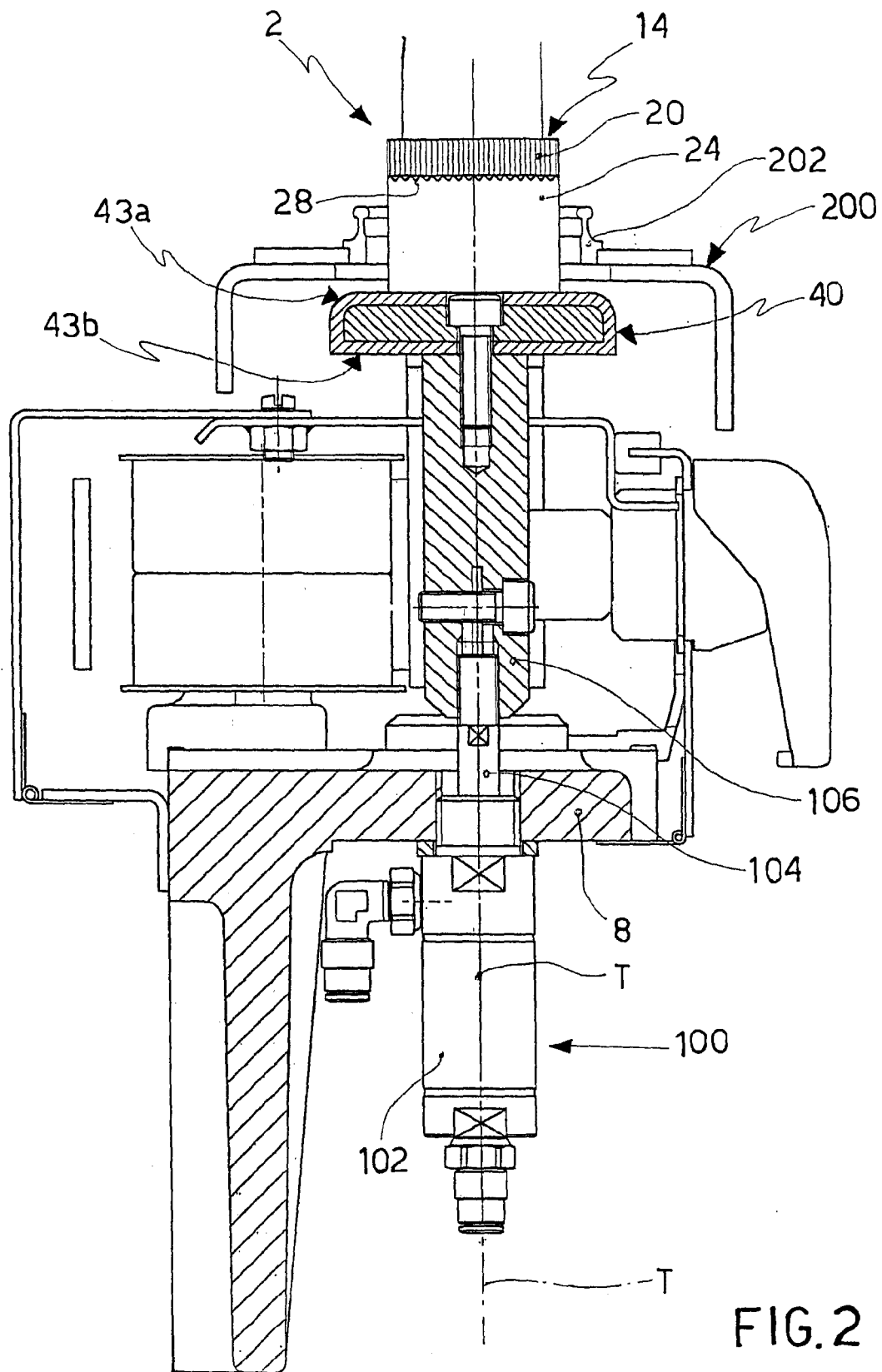
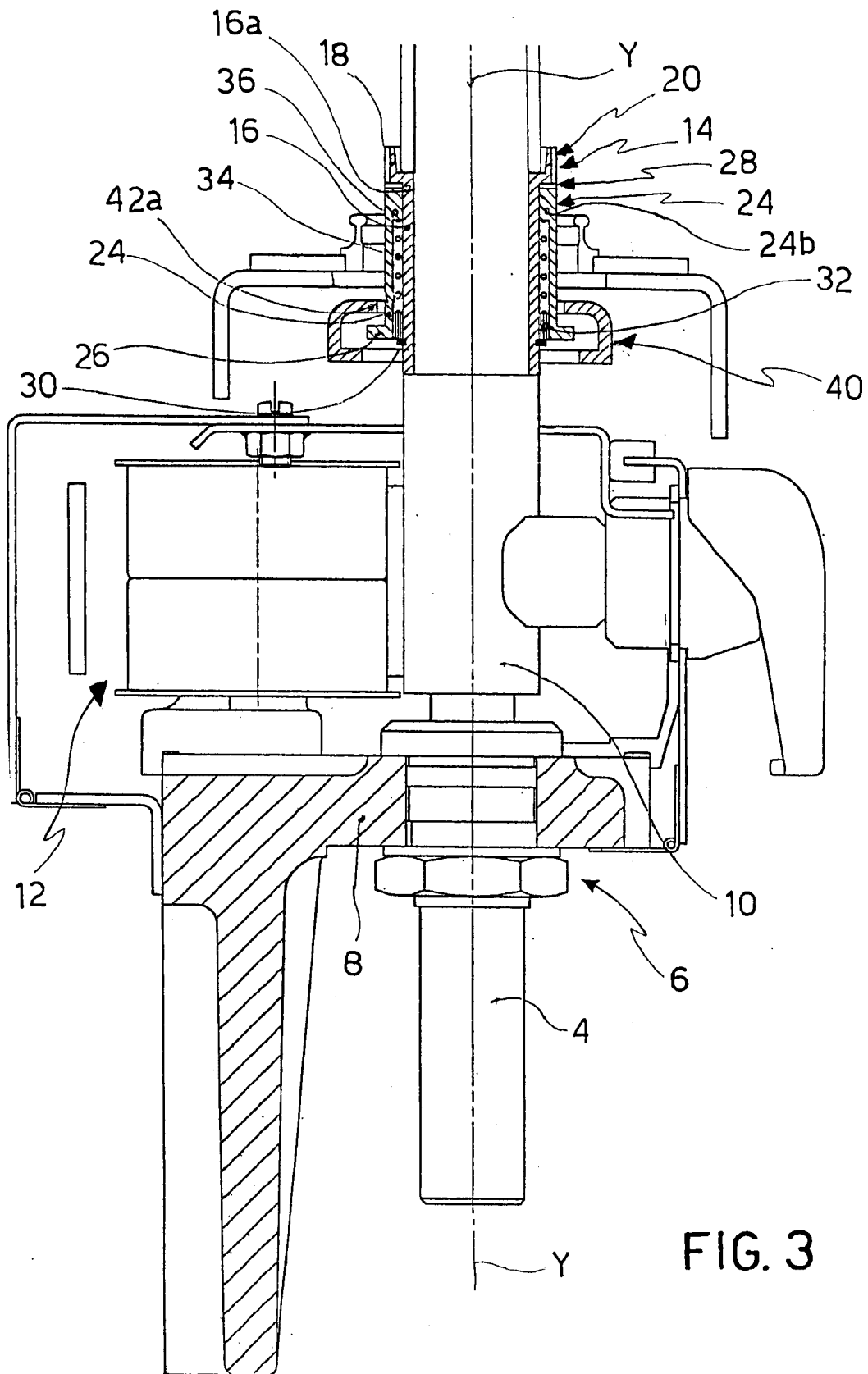
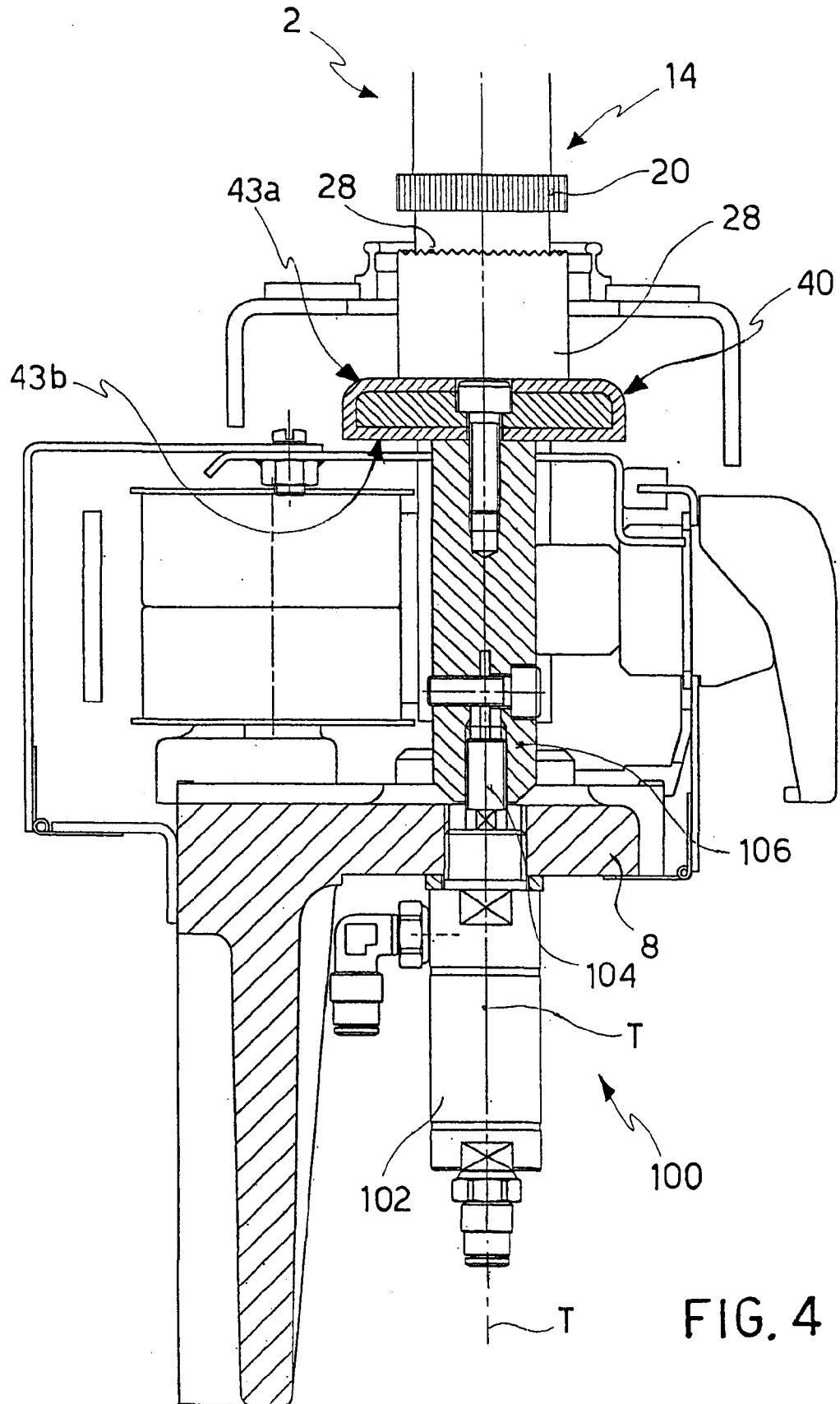
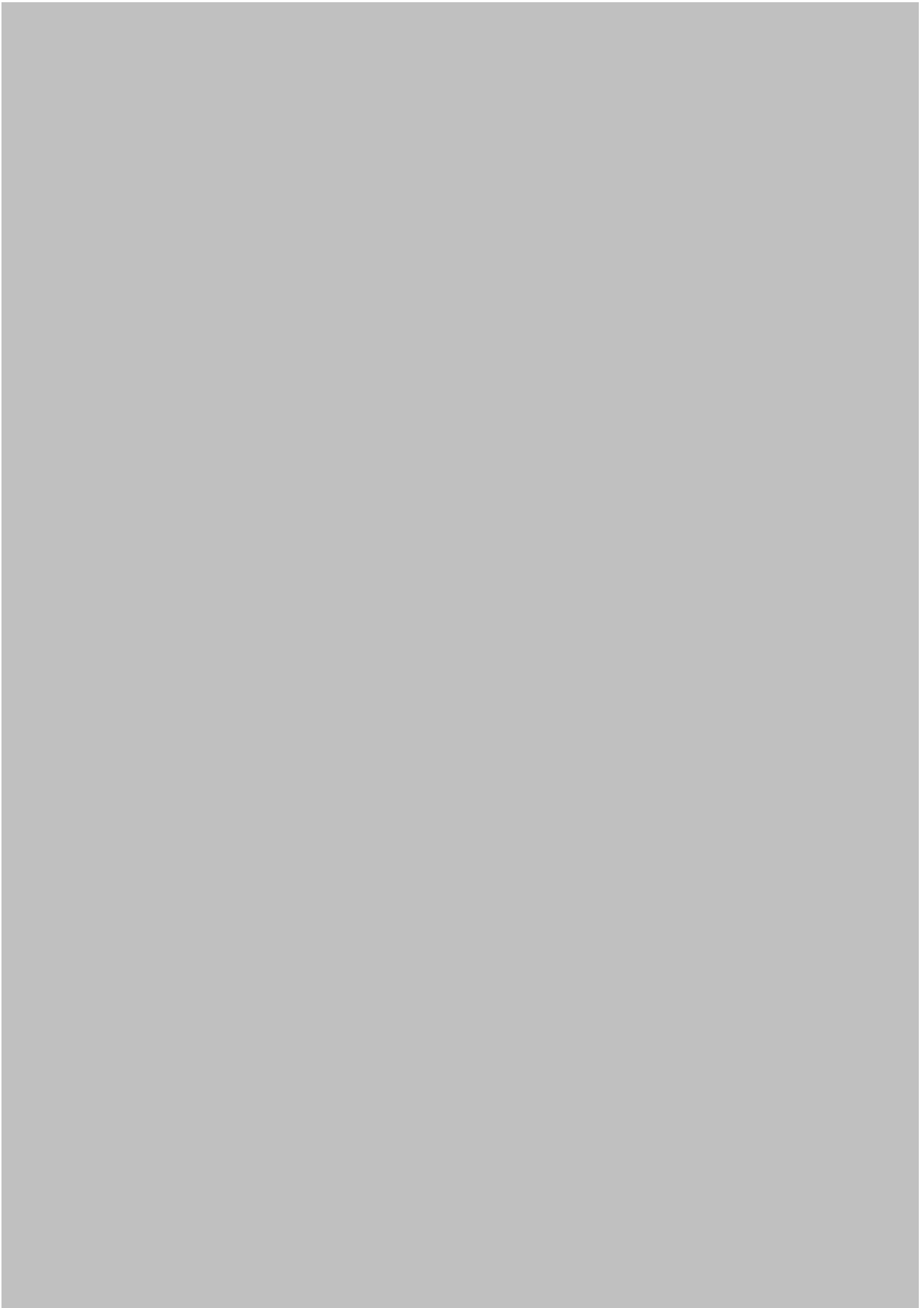


FIG. 1









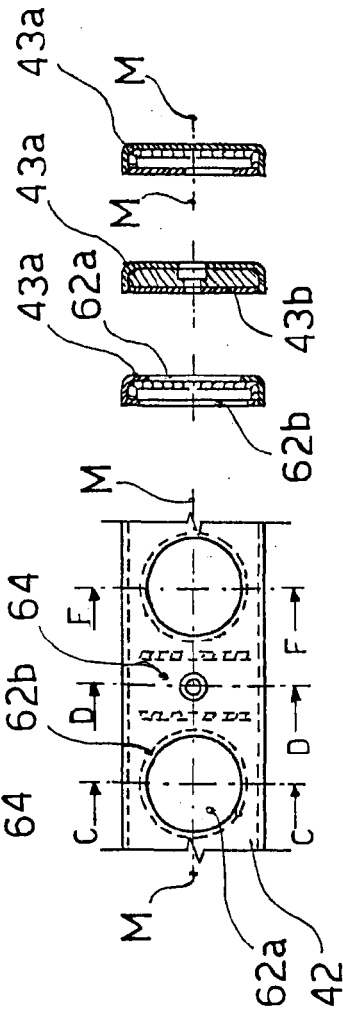
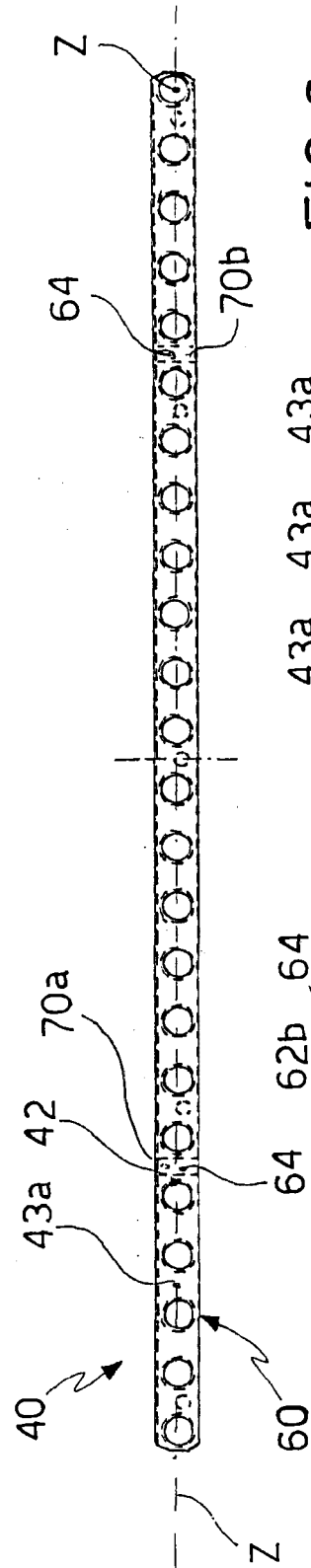


FIG. 7 FIG. 8a FIG. 8b FIG. 8c