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(54) **AN APPARATUS AND METHOD FOR APPLYING A CLOSURE ELEMENT TO A RECEPTACLE BODY OF A CARTRIDGE, PARTICULARLY A CARTRIDGE FOR ELECTRONIC CIGARETTES**

VORRICHTUNG UND VERFAHREN ZUM ANBRINGEN EINES VERSCHLUSSELEMENTS AN EINEN AUFNAHMEBEHÄLTER EINER KARTUSCHE, INSBESONDERE EINER KARTUSCHE FÜR ELEKTRONISCHE ZIGARETTEN

APPAREIL ET PROCÉDÉ D'APPLICATION D'UN ÉLÉMENT DE FERMETURE POUR UN CORPS DE BOÎTIER D'UNE CARTOUCHE, EN PARTICULIER UNE CARTOUCHE POUR CIGARETTES ÉLECTRONIQUES

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Description

TEXT OF THE DESCRIPTION

[0001] The present invention relates to an apparatus and a method for applying a closure element to a receptacle body.

[0002] The field of specific interest refers to producing cartridges for electronic cigarettes operating by vaporization.

[0003] As is known, these cartridges contain flavored liquid which, during operation, is evaporated by the cigarette.

[0004] In some versions, these cartridges are also designed to generate vapor therein.

[0005] In this case, they have a relatively complex structure, considering that, in addition to defining a cavity for containing the liquid, they are provided with electronic components for heating the liquid and also define a passage for dispensing the generated vapor to the outside.

[0006] By way of example, Figure 6 is an exploded view of the structure of a common cartridge of the type indicated.

[0007] This comprises a generally tubular outer body 101, within which a further tubular body 103 is inserted.

[0008] A mouthpiece 105 closes a first end of the body 101 and connects internally to a corresponding end of the inner body 103. Similarly, a vaporizing unit 107 closes the opposite end of the body 101 and connects to the corresponding end of the inner body 103. A seal is usually interposed between the unit 107 and the body 101.

[0009] The flavored liquid is contained in the cavity formed between the inner wall of the body 101 and the outer wall of the body 103.

[0010] Internally, the body 103 instead defines a passage for the vapor, which is placed in communication with the outside through the mouthpiece 105.

[0011] The unit 107 carries the electrical means for heating the liquid, which include an electrical resistance and electrical contacts 108 for establishing an electrical connection with the power source of the electronic cigarette when the cartridge is applied to the cigarette.

[0012] Moreover, the unit 107 has an inner mouth 109, from which the vapor produced by heating the flavored liquid is dispensed, and which goes directly to couple with the corresponding end of the inner tubular body 103.

[0013] So far, diffusion of this type of cartridge is limited, and in fact current production lines of these cartridges still envisage different manual steps, particularly regarding the assembly of the various components.

[0014] However, the situation is changing and an increasing consumption of these articles is envisaged.

[0015] The need to prepare highly automated production lines capable of producing large volumes is therefore evident.

[0016] In this context, the present invention has been developed to create the closure of the body 101 with the vaporizing unit 107 in the context of an industrial produc-

tion method of cartridges of the type described above.

[0017] The Applicant has, in fact, found that closure or capping systems known in the art and already used in other fields (for example, in the food or pharmaceutical field) are not able to meet the specific needs of the application considered herein.

[0018] For correct assembly of the unit 107 on the body 101 the following is particularly indispensable:

- ensuring interlocking coupling between the dispensing mouth 109 and the inner tubular body 103;
- correctly orientating the outer electrical contacts;
- correctly positioning the sealing gasket carried by the unit 107, on the body 101, to make the cartridge seal tight.

[0019] These results must be obtained as part of a method capable of operating on tens or hundreds of pieces per minute.

[0020] US2017/259948 and US2003/056466 disclose prior art that may be of some interest as technical background. Z In particular, US2017/0259948 discloses an apparatus (and the corresponding operating process) for applying a closure element to a receptacle body of a cartridge, comprising: a conveying line comprising supports movable along said line, which are each provided with at least one seat for receiving a receptacle body, said mobile supports conveying a plurality of receptacle bodies along said line, a centering unit comprising a first and a second centering cavity, which are provided with guide surfaces configured to guide said receptacle body and said closure element, respectively, into a predetermined reciprocal position, for applying said closure element onto said receptacle body, as an effect of inserting said receptacle body and said closure element into said first and second cavities respectively; wherein said first and second cavities are aligned with one another along a reference axis and communicate with one another; at least one device for moving said supports for inserting said receptacle body into said first cavity, and for bringing said closure element into a coupled condition with said receptacle body within said centering unit, said supports being movable along a reference plane, for carrying said receptacle bodies to said centering unit.

[0021] In order to meet the aforesaid requirements, the present invention proposes, in general, a new solution for applying a closure element to a receptacle, which relates to:

- an apparatus according to claims 1:
- a method according to claim 11. Further characteristics and advantages of the invention will become apparent from the description that follows with reference to the attached drawings, provided purely by way of non-limiting example, wherein:

- Figure 1 represents an axonometric overall view of a preferred embodiment of the apparatus described herein;
- Figure 2 represents an enlargement of a portion of Figure 1;
- Figure 3 represents the detail of an assembly of the apparatus of Figure 1;
- Figure 4 represents the detail of a support of the apparatus of Figure 1;
- Figures 5A to 5E represent successive steps of the capping process carried out by the apparatus of Figure 1;
- Figure 6 represents an example of a cartridge for electronic cigarettes operating by vaporization.

[0022] In the following description various specific details are illustrated aimed at a thorough understanding of the embodiments. The embodiments may be implemented without one or more of the specific details, or with other methods, components, materials, etc. In other cases, known structures, materials or operations are not shown or described in detail to avoid obscuring various aspects of the embodiments.

[0023] The references used here are only for convenience and do not therefore define the field of protection or the scope of the embodiments.

[0024] The solution described herein relates, in general, to an apparatus and a method for applying a closure element onto a receptacle body.

[0025] As indicated above, the preferred application for this solution relates to producing cartridges for electronic cigarettes, of the type illustrated in Figure 4 and already described above.

[0026] A further preferred application concerns, instead, producing cartridges for aerosol generators in the pharmaceutical field.

[0027] As will become apparent below, this solution can, however, be advantageously used for any process which envisages applying a closure element onto a receptacle body. According to a first aspect, the solution described herein relates to an apparatus comprising:

- a conveying line comprising supports movable along said line, which are each provided with at least one seat for receiving a receptacle body, said mobile supports conveying a plurality of receptacle bodies along said line,
- a gripping head for picking up at least one closure element from a line for supplying closure elements for closing said receptacle bodies;
- a centering unit comprising a first and a second centering cavity, which are provided with guide surfaces configured to guide said receptacle body and said closure element, respectively, into a predetermined reciprocal position, for applying said closure element onto an open end of said receptacle body,

as an effect of inserting said receptacle body and said closure element into said first and second cavities, respectively;

5 wherein said first and second cavities are reciprocally aligned and communicate with one another;

- at least one device for moving said supports and/or said gripping head and/or said centering unit for inserting said receptacle body and said closure element into said first and second cavities, respectively, and for carrying said closure element into a coupled condition with said receptacle body within said centering unit, for example, inside said first or second cavity.

[0028] In the indicated apparatus, the centering unit acts as a reference for the correct alignment position between the receptacle body and the closure element, and is arranged to guide both the two components into this position, through the two indicated cavities.

[0029] Coupling of the two components occurs directly inside the centering unit, as will be shown below.

[0030] The function performed by the centering unit means, on the other hand, that the head that picks up the closure elements, and the mobile supports that carry the receptacle bodies, do not have to guarantee any precise positioning of the respective components.

[0031] In various preferred embodiments, the apparatus described herein is arranged to simultaneously perform the closure of a plurality of receptacle bodies.

[0032] In this case, in various preferred embodiments, the gripping head is equipped with a plurality of pick-up units to simultaneously pick up a plurality of closure elements.

[0033] In the same way, the centering unit is arranged with a series of pairs of cavities, equal to the number of receptacle bodies to be closed in a cycle, each including a first and a second cavity as described above.

[0034] In this case, the centering unit is arranged to simultaneously guide the indicated plurality of receptacle bodies and closure elements, into the respective alignment positions.

[0035] This operation can be carried out by the centering unit regardless of the positions in which the individual components are located, with respect to the devices by which they are carried, before being inserted into the centering unit.

[0036] Therefore, it is not necessary to guarantee that the individual closure elements and the individual receptacle bodies are all in the same relative position, and this greatly facilitates the functions of the gripping head and the mobile supports of the conveying line, for which it is therefore possible to provide a relatively simple configuration and operating methods based on fast kinematic laws.

[0037] The possibility of operating with rapid movements and on several pieces at the same time allows the

apparatus described here to produce large production volumes.

[0038] With reference now to the figures, these illustrate a preferred embodiment of the apparatus described herein.

[0039] In various preferred embodiments, as in the illustrated one, the apparatus comprises a conveying line consisting of a guide 2, on which a plurality of slides 4 that carry supports 6 for housing the receptacle bodies 111 are movable.

[0040] With reference to the mentioned application example, relative to the cartridge of Figure 6, the receptacle body 111 corresponds to the set of bodies 101 and 103 and the mouthpiece 105.

[0041] In various preferred embodiments, the conveying line is arranged with a drive system of the slides 4 consisting of a linear electric motor.

[0042] This type of drive system is already known in the art, so that no further details will be provided thereon so as not to burden the present description.

[0043] For what is of interest here, it is merely noted that this type of drive system offers the advantage of allowing the control of advancing individual slides 4 independently of the other slides, with reference to all the kinematic parameters or direction, speed and acceleration.

[0044] According to alternative embodiments not illustrated, the conveying line can be of a different type with respect to that shown in the figures. For example, this conveying line may comprise a conveyor belt on which the indicated movable supports are mounted and which draws these supports along the expected advancing path. The belt can be wound on pulleys, of which at least one is motorized to drive the movement of the belt. In various preferred embodiments, as in the illustrated one (see in particular Figure 4), each support 6 comprises a support bracket 22 which is fixed to the base structure of the slide 4, and which defines a support plane P above for the respective body 111 which is placed on said support.

[0045] At said plane, each support 6 is, furthermore, arranged with an assembly 24 able to support the body 111 in a vertical position.

[0046] In various embodiments, as well as in the one illustrated, this assembly is provided with abutment walls 26, 32 which entirely or partially surround the outer side wall of the body 111, so as to contain it laterally. Preferably, each abutment wall and the respective opposite wall are mutually positioned at a distance slightly greater than the size of the body 111 in the corresponding plane.

[0047] It should be noted that the assembly 24 is arranged to hold the body 111 allowing it to make small movements.

[0048] As will be seen below, in this way, the position of this body, with respect to the support 6 by which it is carried, can be adjusted.

[0049] In various preferred embodiments, as in the illustrated one, each assembly 24 is arranged to simulta-

neously hold two bodies 111. At an area which, as will be seen below, represents the capping station of the apparatus, the conveying line interfaces with a line 42 for supplying the closure elements 107. With reference to the mentioned application example, these correspond to the vaporizing unit 107 of Figure 6.

[0050] The elements 107 can be carried by the line 42 on trays, on which they are arranged according to a succession of rows that extend along the same movement direction of the line 42.

[0051] This line consists of a single conveying branch which moves the trays in the two opposite directions, respectively, to carry the loaded trays to the conveying line 2 and to return the empty trays to a loading station for the elements 107.

[0052] In various preferred embodiments, the supply line 42 comprises two parallel branches of the indicated type, which are synchronized to operate in an offset manner, so that when the trays of a branch lie at the line 2, the trays of the other branch are located at the loading station.

[0053] As indicated above, the apparatus 10 comprises a gripping head 12 for removing the closure elements 107 from the supply line 42 and for applying them onto the receptacle bodies 111.

[0054] The head 12 is carried by a motion-drive device 14 which is arranged to move the head along one or more directions so that it can operate the aforesaid functions.

[0055] In various preferred embodiments, as well as in the illustrated one, this device consists of a manipulator robot.

[0056] The head 12 is arranged with one or more pick-up units 16, each comprising a tubular rod 161 connected to a suction unit 162, for example, a Venturi system; a duct is connected to the unit 162 consisting of a Venturi system, (not shown in the figures) for supplying the air.

[0057] The pick-up unit 16 operates by vacuum.

[0058] A vacuum condition is created inside the tubular rod 161, and the closure element attracted by this condition comes into contact with the lower edge of the rod. The rod 161 has, in the illustrated case, a diameter smaller than the width of the elements 107.

[0059] In various preferred embodiments, as in the one illustrated, the head 12 is equipped with a plurality of pick-up units 16, in order to operate simultaneously on several closure elements 107.

[0060] In various preferred embodiments, as in the one illustrated, the rods 161 of these units are arranged according to an array corresponding to that with which the closure elements 107 are supplied by the line 42.

[0061] In various preferred embodiments, as in the one illustrated, the rods 161 are, in particular, ordered in a row, at a distance from each other that is substantially equal to the distance separating the individual closure elements 107 of the same row. This distance can be defined by the midline.

[0062] In the illustrated example, the gripping head 12 is arranged to operate with the rods 161 of the pick-up

units 16 arranged in an orientation parallel to the direction Z (see the reference system shown in Figure 1) .

[0063] The pick-up operations of the elements 107 carried out by this head, and their application onto the bodies 111, are carried out due to the movement of the rods 161 along the same direction Z. Preferably, this movement is performed by the manipulator robot.

[0064] Incidentally, it should be noted that the apparatus described here can - in any case - be arranged to perform the aforesaid functions along other directions, for example along the direction X or the direction Y.

[0065] In various preferred embodiments, as well as in the one illustrated, the rods 161 are mounted on the supporting structure of the gripping head 12 through interposition of elastic elements 163, so that they are singularly yieldable along the direction Z.

[0066] In various preferred embodiments, as in the illustrated one (see Figure 5A), the elastic element 163 is interposed between the single unit 16 and the supporting structure of the head 12. Alternatively, the elastic element in question can be integrated within the unit 16 and act directly on the rod 161.

[0067] As will be explained in greater detail below, this yielding behavior on the part of the individual rods 161 makes it possible to compensate for any locking or interlocking conditions that may occur for a single pick-up unit 16 during application of the element 107 onto the body 111, allowing other units to complete their operations.

[0068] As seen above, the units 16 hold the elements 107 by vacuum, in a condition in which they are held against the lower edges of the rods 161.

[0069] The expert skilled in the art will understand that, in this condition, the elements 107 can be subjected to small displacements in the plane perpendicular to the direction of the rods 161, although they continue to be kept by these.

[0070] The apparatus 10 also comprises a centering unit 18, which, as already anticipated above, has the function of positioning the receptacle bodies 111 and the closure elements 107 in a predetermined reciprocal position, for correctly applying the closure elements on the receptacle bodies.

[0071] In particular, this positioning may relate to alignment of the receptacle body and the closure element along a reference axis, and/or rotation of the two components about a reference axis until it assumes a given orientation.

[0072] For this object, the centering unit 18 is arranged with one or more pairs of cavities 181, 182 internally defining guide surfaces 181A, 182A able to guide the element 107 and the body 111, respectively, into corresponding positions in order to establish the aforesaid reciprocal predetermined position, due to their insertion in these cavities.

[0073] Preferably, the two cavities 181, 182 extend from two opposite sides of the centering unit 18. They are mutually aligned defining the same reference axis R, which, in the illustrated example, is oriented along the Z

direction. The person skilled in the art will understand that the orientation direction of this axis R depends on the direction along which the gripping head 12 acts to perform the capping operation.

[0074] Moreover, the two cavities 181 and 182 communicate with each other to allow application of the element 107 onto the body 111, directly inside the same centering unit 18, after the two components have been correctly positioned.

[0075] The centering unit 18 is intended to be interposed between the gripping head 12 and the supports 6, and the two components 107, 111 are inserted within the cavities 181 and 182 at the two opposite sides of the centering unit, until they reach the predetermined reciprocal position.

[0076] In various preferred embodiments, as in the one illustrated, the guide surfaces 181A and 182A both have a generally conical conformation. More generally, these surfaces have a concave conformation which defines a geometric axis corresponding to the axis R, and has decreasing sections along the same axis, for each surface in the direction directed towards the other surface. This decreasing behavior starts from the outer opening of the corresponding cavity, until it reaches a section that reproduces at least a part of the section of the closure element or of the receptacle body according to geometry and dimensions.

[0077] This behavior may obviously vary in its particular characteristics, depending on the needs of the specific applications.

[0078] The centering unit 18 is carried by a structure 190, which is arranged to retain the cavities 181, 182 and the reference axis R in position, relative to the reference system X, Y, Z.

[0079] This area of the conveyor line in which the centering unit is located is, in fact, the capping station of the apparatus.

[0080] In various preferred embodiments, as in the illustrated one, the structure 190 is equipped with a movement system, which is configured to move the centering unit 18 along the direction Z, for the functions that will be described below. This system can, for example, comprise a linear guide device controlled by a linear actuator, for example, a screw actuator.

[0081] In various preferred embodiments, as in the one illustrated, the centering unit 18 defines a plurality of centering members. In particular, the centering unit 18 is arranged with a plurality of cavities 181 and 182, equal to the number of pick-up units 16, in order to be able to operate simultaneously on all the elements 107 and the bodies 111 which are carried, by the pick-up units 16 and by the slides 4, in the capping station.

[0082] The various pairs of cavities 181 and 182 are mutually positioned according to an array corresponding to that provided for the pick-up units 16. In various preferred embodiments, as well as in the one illustrated, these pairs are, in particular, arranged in a row and positioned at a mutual distance equal to the distance pro-

vided between the individual rods 161 of the pick-up units 14. This distance can be defined by the midline.

[0083] In various preferred embodiments, as well as in the illustrated one (see Figure 3), the centering unit 18 has a modular structure comprising a support plate 183, on which an array of separate formations of blocks 184, which each define a pair of cavities 181, 182 is mounted. The single formation comprises at least two blocks 184 arranged with respective walls able to delimit a corresponding part of the two cavities 181, 182, and also define a respective portion of the guide surfaces 181A, 182A described above.

[0084] In various preferred embodiments, as well as in the illustrated one, each formation comprises four blocks 184, 185 positioned, two by two, according to a reciprocal opposite arrangement.

[0085] The blocks 184, 185 of the various formations are mounted on the plate 183 with the possibility of adjusting their position along the direction X and/or the direction Y, by screw means and, possibly, cam means.

[0086] This configuration of the centering unit 18 allows precise definition of the geometry, the dimensions and the position of all the cavities 181 and 182.

[0087] Moreover, the geometry and dimensions of the cavities 181 and 182 may also vary between the different apparatuses based on the specific applications for which they are intended.

[0088] Clearly, the apparatus 10 also includes a control unit - not shown - to govern the operations of the devices described.

[0089] The operation of the described apparatus will now be described, with particular reference to the illustrated preferred embodiment.

[0090] As seen above, the supports 6 receive the bodies 111 at a loading station for these bodies.

[0091] After loading, the supports 6 advance along the line until they reach the capping station. Clearly, upstream of this station, along the line 2, additional stations can be arranged to perform a series of operations before closing the receptacle bodies 111.

[0092] At the capping station, the supply line 42 supplies the closure elements 107 arranged in a succession of rows.

[0093] Through the operation of the manipulator robot, the gripping head 12 picks up the first row of closure elements 107 (the one closest to the conveying line 2), by means of the units 14, and places it above the centering unit 18. In particular, the gripping head 12 is positioned above the centering unit 18 so that the rods 161 are substantially aligned, each with the reference axis R of a corresponding pair of cavities 181, 182 of the centering unit (Figure 5A).

[0094] At the same time, or previously, a plurality of supports 6, which altogether carry a number of receptacle bodies 111 equal to the number of picked-up closure elements 107, group together under the centering unit 18, according to a positioning so that each body 111 is substantially aligned with a corresponding cavity 182 of the

unit 18 (Figure 5A).

[0095] When the gripping head 12 and the supports 6 are positioned, respectively, above and below the centering unit 18, the gripping head makes, at that point, a downward movement, along the direction Z, to insert the elements 107 within the corresponding cavities 181 of the centering unit 18 (Figure 5B).

[0096] As stated above, the surfaces 181A of these cavities guide the elements 107 into the respective predetermined reference position.

[0097] Subsequently, the gripping head 12 and the centering unit 18 together complete a further downward movement along the direction Z, until the bodies 111 are inserted within the corresponding cavities 182 of the centering unit 18 (Figure 5C).

[0098] Also in this case, during insertion, the surfaces 182A of these cavities guide the bodies 111 into the respective predetermined reference position.

[0099] In this regard, it should be noted that the assemblies 24 of the supports 6 already perform a function of positioning the bodies 111, so that the latter will be present below the centering unit according to a relatively precise positioning.

[0100] In this case, the action exerted by the surfaces 182A can therefore either consist of a very limited adjustment of the position of these bodies with respect to the seats in which they are received in the supports 6 (for example of the order of millimeters), or even only in accompanying them inside the centering unit, this depending on how the individual bodies 111 are positioned on the respective supports 6.

[0101] It should be noted that the two operations indicated for inserting the bodies 111 and the elements 107 into the centering unit 18 can also be performed in the reverse order or simultaneously.

[0102] Once the bodies 111 and the elements 107 have all been inserted within the centering unit 18, they are in the predetermined reciprocal position to correctly perform their coupling.

[0103] In particular, at this point, the gripping head 12 makes a further downward movement along the direction Z, while the centering unit 18 remains stationary, so as to insert the elements 107 within the upper openings of the bodies 111 (Figure 5D).

[0104] With reference to the Figure, it should be noted that at the end of this movement, the closure elements 107 present themselves to have been moved from the cavities 181 to the inside of the cavities 182.

[0105] After the two components have been coupled, the centering unit 18 first moves upwards, freeing the now closed bodies 111 from the engagement (Figure 5E). Subsequently, the gripping head 12 also moves upwards.

[0106] This sequence for releasing the bodies 111 is the preferred one, since in this way, when the centering unit separates from the elements 111, the gripping head 12, which still engages the elements 107, blocks these against the bodies 111, preventing them from being pulled away by the centering unit 18 by friction.

[0107] In any case, this sequence can also be reversed.

[0108] In order to ensure optimum closure of the bodies 111, the apparatus described herein can also comprise, downstream of the capping station, a beater device 17, able to further press the closure elements 107 against the bodies 111, so as to complete coupling of those elements 107 that, for any reason, had not been correctly coupled in the capping station. This device can, for example, comprise a plurality of pressure blocks which have an elastic structure or are combined with elastic elements, and are carried by a structure that is mobile along the direction Z, in order to precisely press against the elements 107. The elastic behavior of these blocks allows avoidance of transmitting any overloading on the bodies 111 and on the supports 6 that carry them.

[0109] Moreover, the apparatus described here can also provide a vision system, arranged downstream of the capping station and of the beating device, to identify any defective or damaged products to be sent to the scrap.

[0110] In view of the above, the advantages of the apparatus and method described herein will be apparent to the person skilled in the art.

[0111] As seen, the function performed by the centering unit 18 ensures - on the one hand - correct closure of the bodies 111 by the elements 107, and - on the other hand - considerably facilitates the functions of the gripping head 12 and of the supports 6.

[0112] In particular, these must simply retain the components, but they do not necessarily have to guarantee their precise positioning within the capping station.

[0113] For this same reason, these devices can operate according to fast kinematic laws, since small misalignments that could occur during their movement, in any case, are corrected and compensated by the centering unit.

[0114] Finally, thanks to the function performed by the centering unit, the solution described herein is able to perform the capping operation simultaneously on a plurality of components, precisely using the head 12 described, as the only gripping device.

[0115] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even significantly, with respect to those illustrated here, purely by way of non-limiting example, without departing from the scope of the invention as defined by the attached claims.

Claims

1. An apparatus for applying a closure element (107) to a receptacle body (111) of a cartridge, particularly a cartridge for electronic cigarettes, comprising:

- a conveying line (2) comprising supports (6) movable along said line, which are each provided with at least one seat for receiving a recep-

tacle body (111), said mobile supports (6) conveying a plurality of receptacle bodies (111) along said line,

- a gripping head (12) for picking up at least one closure element (107) from a line for supplying closure elements (107) for closing said receptacle bodies (111);
- a centering unit (18) which is positioned in a capping station of said apparatus,

wherein:

- said supports (6) are movable along a reference plane (X, Y) for carrying said receptacle bodies (111) to said centering unit (18);
- said gripping head (12) is movable along said reference plane (X, Y) for carrying said at least one closure element (107) to said centering unit (18),
- said centering unit (18) is carried by a structure (190) that places said centering unit (18) in a working position that is fixed, when defined with respect to said reference plane,

said centering unit comprising a first and a second centering cavity (182, 181), which are provided with guide surfaces (182A, 181A) configured to guide said receptacle body (111) and said closure element (107), respectively, into a predetermined reciprocal position, for applying said closure element (107) onto said receptacle body (111), as an effect of inserting said receptacle body and said closure element into said first and second cavities (182, 181) respectively; wherein said first and second cavities (182, 181) are aligned with one another along a reference axis (R) and communicate with one another;

- at least one device for moving said supports (6) and/or said gripping head (112) and/or said centering unit (18) for inserting said receptacle body (111) and said closure element (107) into said first and second cavities (182, 181), respectively, and for bringing said closure element (107) into a coupled condition with said receptacle body (111) within said centering unit.

2. An apparatus according to claim 1, wherein said first and second cavities (182, 181) are provided on opposite sides of said centering unit (18).

3. An apparatus according to any one of the preceding claims, wherein said guide surfaces (182A, 181A) have a conical conformation.

4. An apparatus according to any one of the preceding claims, wherein said guide surfaces (182A, 181A) each have a concave conformation that defines an axis coinciding with said reference axis (R), and

cross-sections decreasing along said axis (R), in the direction towards the other surface.

5. An apparatus according to any one of the preceding claims, wherein said centering unit (18) comprises a base structure (183), and at least one formation of blocks that are mounted on said base structure (183), which comprises at least one first block and one second block (184), wherein said first and second blocks are positioned on said base structure according to a relative opposed arrangement and together define said first and second cavities (182, 181); wherein said first and second blocks (184) are adjustable in position with respect to said base structure (183). 5
6. An apparatus according to claim 5, wherein said first block (184) delimits a first portion of said first and second cavities (182, 181) and defines corresponding portions of said guide surfaces (182A, 181A), and wherein said second block (184) delimits a second portion of said first and second cavities and defines corresponding portions of said guide surfaces (182A, 181A). 10 15 20 25
7. An apparatus according to any one of the preceding claims, wherein said at least one moving device includes a motion-drive device (14) that carries said gripping head (12) and is configured to move said head inside a three-dimensional space (X, Y, Z). 30
8. An apparatus according to any one of the preceding claims, comprising a supporting structure (190) that carries said centering unit (18) and is configured to move said unit along a given direction (Z) for inserting and extracting, said receptacle body (111) in and out from said first cavity (182). 35
9. An apparatus according to any one of the preceding claims, wherein said gripping head (12) is configured to hold said closure element (107) against a predefined edge of said head, operated by a vacuum. 40
10. An apparatus according to any of the previous claims, wherein 45
 - said gripping head (12) comprises a plurality of pick-up units (16) for picking up a plurality of said closure elements (107), 50
 - said centering unit (18) is positioned in a capping station of said apparatus, and said conveying line (2) is configured to place a plurality of receptacle bodies (111) in said capping station at the same time. 55
 - said centering unit (18) comprises a plurality of centering members, each comprising said first and second cavities (182, 181), for operat-

ing simultaneously on said plurality of receptacle bodies (111) and closure elements (107).

11. A method for applying a closure element (107) to a receptacle body (111) of a cartridge, particularly a cartridge for electronic cigarettes, comprising the following steps:

- advancing a plurality of receptacle bodies (111) along a conveying line (2), said bodies (111) being carried by supports (6) that are movable along said line;
- supplying a plurality of closure elements (107) for closing said receptacle bodies (111), along a supplying line (42);
- picking up at least one closure element (107) from said supplying line, by means of a gripping head (12);
- providing a centering unit (18) in a capping station,
- placing at least one receptacle body (111) in the capping station by carrying the at least one receptacle body (111) to the centering device (18) by at least one support (6) that moves along said conveying line (2) and along a reference plane (X, Y);
- carrying the at least one closure element (107) to the centering device (18) by the gripping head that moves along the reference plane (X; Y),

wherein said centering unit (18) is in a working position that is fixed, when defined with respect to said reference plane (X; Y), carried by a structure (190), said centering unit comprising at least one first and at least one second centering cavity (182, 181), which are provided with guiding surfaces (182A, 181A) configured to guide said receptacle body (111) and said closure element (107) into a predetermined reciprocal position, for applying said closure element (107) onto said receptacle body (111), as an effect of inserting said receptacle body (111) and said closure element (107) into said first and second cavities (182, 181), respectively, wherein said first and second cavities are aligned with one another along a reference axis (R) and communicate with one another;

said method including:

- inserting said closure element (107) into said second centering cavity (181) and by means of the corresponding guiding surfaces guiding the closure element into the predetermined reciprocal position with respect to the receptacle body;
- inserting said receptacle body (111) into said first centering cavity (182) and by means of the corresponding guiding surfaces guiding the receptacle body into the predetermined reciprocal position with respect to the closure element;

- coupling said closure element (107) to said receptacle body (111) within said centering unit (18).

12. A method according to claim 11, wherein said step of inserting said closure element (107) into said second centering cavity (181) includes moving said gripping head (12) along a direction (Z) that is parallel or coinciding with said reference axis (R), towards said centering unit (18). 5
13. A method according to claims 11 or 12, wherein said step of inserting said receptacle body (111) into said first centering cavity (182) includes moving said centering unit (18) along a direction (Z) that is parallel or coinciding with said reference axis (R), towards said mobile support (6) that carries said receptacle body (111). 10
14. A method according to any one of claims from 11 to 13, wherein said step of coupling said closure element (107) to said receptacle body (111) includes moving said gripping head (12) along a direction (Z) parallel or coinciding with said reference axis (R), towards said mobile support (6) that carries said receptacle body (111). 20
15. A method according to any one of claims 11 to 14, which includes employing a single gripping head (12) and wherein said steps of picking up, placing, inserting and coupling, simultaneously involve a plurality of receptacle bodies (111) and a plurality of closure elements (107). 25
16. A method according to any one of claims 11 to 15, wherein said first and second cavities (182, 181) are provided at opposite sides of said centering unit (18), and wherein said steps of inserting said closure element (107) and of inserting said receptacle bodies (111) are carried out, respectively, from opposite sides of said centering unit (18). 30

Patentansprüche

1. Vorrichtung zum Anbringen eines Verschlusselements (107) an einem Aufnahmebehälter (111) einer Kartusche, insbesondere einer Kartusche für elektronische Zigaretten, umfassend: 45
- eine Förderlinie (2) mit entlang der Linie bewegbaren Trägern (6), die jeweils mit mindestens einem Sitz zum Aufnehmen eines Aufnahmebehälters (111) versehen sind, wobei die bewegbaren Träger (6) eine Vielzahl von Aufnahmebehältern (111) entlang der Linie befördern, 50
- einen Greifkopf (12) zum Aufnehmen mindestens eines Verschlusselements (107) aus einer

Linie zum Zuführen von Verschlusselementen (107) zum Verschließen der Aufnahmebehälter (111);

- eine Zentriereinheit (18), die in einer Verschließstation der Vorrichtung angeordnet ist,

wobei:

- die Träger (6) entlang einer Bezugsebene (X, Y) bewegbar sind, um die Aufnahmebehälter (111) zur Zentriereinheit (18) zu transportieren;

- der Greifkopf (12) entlang der Bezugsebene (X, Y) bewegbar ist, um das mindestens eine Verschlusselement (107) zur Zentriereinheit (18) zu transportieren,

- die Zentriereinheit (18) durch einen Aufbau (190) getragen wird, der die Zentriereinheit (18) in eine Arbeitsposition bringt, die fest ist, wenn sie in Bezug auf die Bezugsebene definiert ist,

wobei die Zentriereinheit einen ersten und einen zweiten Zentrierhohlraum (182, 181) umfasst, die mit Führungsflächen (182A, 181A) versehen sind, die dazu eingerichtet sind, den Aufnahmebehälter (111) bzw. das Verschlusselement (107) in eine vorbestimmte wechselseitige Position zu führen, um das Verschlusselement (107) als eine Wirkung des Einsetzens des Aufnahmebehälters und des Verschlusselements in den ersten bzw. zweiten Hohlraum (182, 181) auf den Aufnahmebehälter (111) aufzubringen;

wobei der erste und der zweite Hohlraum (182, 181) entlang einer Bezugsachse (R) zueinander ausgerichtet sind und miteinander in Verbindung stehen;

- mindestens eine Vorrichtung zum Bewegen der Träger (6) und/oder des Greifkopfes (112) und/oder der Zentriereinheit (18) zum Einführen des Aufnahmebehälters (111) und des Verschlusselements (107) in den ersten bzw. zweiten Hohlraum (182, 181) und zum Bringen des Verschlusselements (107) in einen gekoppelten Zustand mit dem Aufnahmebehälter (111) innerhalb der Zentriereinheit.

2. Vorrichtung gemäß Anspruch 1, wobei der erste und der zweite Hohlraum (182, 181) auf gegenüberliegenden Seiten der Zentriereinheit (18) vorgesehen sind. 50
3. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Führungsflächen (182A, 181A) eine konische Form aufweisen.
4. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Führungsflächen (182A, 181A) jeweils eine konkave Form, die eine mit der Bezugsachse (R) zusammenfallende Achse definiert, und

Querschnitte aufweisen, die entlang der Achse (R) in Richtung auf die andere Fläche abnehmen.

5. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Zentriereinheit (18) eine Basisstruktur (183) und mindestens eine auf der Basisstruktur (183) angebrachte Formation von Blöcken umfasst, die mindestens einen ersten Block und einen zweiten Block (184) umfasst, wobei der erste und der zweite Block auf der Basisstruktur gemäß einer relativ gegenüberliegenden Anordnung positioniert sind und zusammen den ersten und den zweiten Hohlraum (182, 181) definieren; wobei die Position des ersten und des zweiten Blocks (184) in Bezug auf die Basisstruktur (183) einstellbar sind. 5
6. Vorrichtung gemäß Anspruch 5, wobei der erste Block (184) einen ersten Abschnitt des ersten und zweiten Hohlraums (182, 181) begrenzt und entsprechende Abschnitte der Führungsflächen (182A, 181A) definiert, und wobei der zweite Block (184) einen zweiten Abschnitt des ersten und zweiten Hohlraums begrenzt und entsprechende Abschnitte der Führungsflächen (182A, 181A) definiert. 10
7. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die mindestens eine Bewegungsvorrichtung eine Bewegungsantriebsvorrichtung (14) enthält, die den Greifkopf (12) trägt und dazu eingerichtet ist, den Kopf innerhalb eines dreidimensionalen Raums (X, Y, Z) zu bewegen. 15
8. Vorrichtung gemäß einem der vorhergehenden Ansprüche, umfassend einen Stützaufbau (190), der die Zentriereinheit (18) trägt und dazu eingerichtet ist, die Einheit entlang einer gegebenen Richtung (Z) zu bewegen, um den Aufnahmebehälter (111) in den ersten Hohlraum (182) einzuführen und aus diesem herauszuziehen. 20
9. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei der Greifkopf (12) dazu eingerichtet ist, das Verschlusselement (107) durch eine Vaku- um gegen eine vordefinierte Kante des Kopfes zu halten. 25
10. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei 30
 - der Greifkopf (12) eine Vielzahl von Aufnahmeeinheiten (16) zum Aufnehmen einer Vielzahl der Verschlusselemente (107) umfasst,
 - die Zentriereinheit (18) in einer Verschleißstation der Vorrichtung positioniert ist und die Förderlinie (2) dazu eingerichtet ist, eine Vielzahl von Aufnahmebehältern (111) gleichzeitig in der Verschleißstation zu platzieren, 35

- die Zentriereinheit (18) eine Vielzahl von Zentrierelementen umfasst, die jeweils den ersten und den zweiten Hohlraum (182, 181) umfassen, um gleichzeitig auf die Vielzahl von Aufnahmebehältern (111) und Verschlusselementen (107) zu wirken.

11. Verfahren zum Anbringen eines Verschlusselements (107) an einem Aufnahmebehälter (111) einer Kartusche, insbesondere einer Kartusche für elektronische Zigaretten, umfassend die folgenden Schritte:

- Verschieben einer Vielzahl von Aufnahmebehältern (111) entlang einer Förderlinie (2), wobei die Behälter (111) durch Träger (6) transportiert werden, die entlang der Linie bewegbar sind;
- Zuführen einer Vielzahl von Verschlusselementen (107) zum Verschließen der Aufnahmebehälter (111) entlang einer Zuführlinie (42);
- Aufnehmen mindestens eines Verschlusselements (107) aus der Zuführlinie mittels eines Greifkopfes (12);
- Bereitstellen einer Zentriereinheit (18) in einer Verschleißstation,
- Platzieren mindestens eines Aufnahmebehälters (111) in der Verschleißstation durch Transportieren des mindestens einen Aufnahmebehälters (111) zur Zentriervorrichtung (18) durch mindestens einen Träger (6), der sich entlang der Förderlinie (2) und entlang einer Bezugsebene (X, Y) bewegt;
- Transportieren des mindestens einen Verschlusselements (107) zur Zentriervorrichtung (18) durch den Greifkopf, der sich entlang der Bezugsebene (X, Y) bewegt,

wobei sich die Zentriereinheit (18) in einer Arbeitsposition befindet, die feststehend ist, wenn sie in Bezug auf die Bezugsebene (X, Y) definiert ist, die durch einen Aufbau (190) getragen wird, wobei die Zentriereinheit mindestens einen ersten und mindestens einen zweiten Zentrierhohlraum (182, 181) umfasst, die mit Führungsflächen (182A, 181A) versehen sind, die dazu eingerichtet sind, den Aufnahmebehälter (111) und das Verschlusselement (107) in eine vorbestimmte wechselseitige Position zu führen, um das Verschlusselement (107) als Folge des Einführens des Aufnahmebehälters (111) und des Verschlusselements (107) in den ersten bzw. zweiten Hohlraum (182, 181) auf den Aufnahmebehälter (111) aufzubringen, wobei der erste und der zweite Hohlraum entlang einer Bezugsachse (R) aufeinander ausgerichtet sind und miteinander in Verbindung stehen; wobei das Verfahren beinhaltet:

- Einsetzen des Verschlusselements (107) in

- den zweiten Zentrierhohlraum (181) und Führen des Verschlusselements mittels der entsprechenden Führungsflächen in die vorbestimmte wechselseitige Position in Bezug auf den Aufnahmebehälter;
- Einsetzen des Aufnahmebehälters (111) in den ersten Zentrierhohlraum (182) und Führen des Aufnahmebehälters mittels der entsprechenden Führungsflächen in die vorbestimmte wechselseitige Position in Bezug auf das Verschlusselement;
- Koppeln des Verschlusselements (107) mit dem Aufnahmebehälter (111) innerhalb der Zentriereinheit (18) .
12. Verfahren gemäß Anspruch 11, wobei der Schritt des Einsetzens des Verschlusselements (107) in den zweiten Zentrierhohlraum (181) das Bewegen des Greifkopfes (12) entlang einer Richtung (Z), die parallel zur Bezugsachse (R) verläuft oder mit dieser zusammenfällt, in Richtung der Zentriereinheit (18) beinhaltet.
13. Verfahren gemäß Anspruch 11 oder 12, wobei der Schritt des Einsetzens des Aufnahmebehälters (111) in den ersten Zentrierhohlraum (182) das Bewegen der Zentriereinheit (18) entlang einer Richtung (Z), die parallel zur Bezugsachse (R) verläuft oder mit dieser zusammenfällt, in Richtung des bewegbaren Trägers (6), der den Aufnahmebehälter (111) trägt, beinhaltet.
14. Verfahren gemäß einem der Ansprüche 11 bis 13, wobei der Schritt des Koppelns des Verschlusselements (107) mit dem Aufnahmebehälter (111) das Bewegen des Greifkopfes (12) entlang einer Richtung (Z), die parallel zur Bezugsachse (R) verläuft oder mit dieser zusammenfällt, in Richtung des bewegbaren Trägers (6), der den Aufnahmebehälter (111) trägt, beinhaltet.
15. Verfahren gemäß einem der Ansprüche 11 bis 14, das die Verwendung eines einzelnen Greifkopfes (12) enthält und wobei die Schritte des Aufnehmens, Platzierens, Einsetzens und Koppelns gleichzeitig eine Vielzahl von Aufnahmebehältern (111) und eine Vielzahl von Verschlusselementen (107) einbeziehen.
16. Verfahren gemäß einem der Ansprüche 11 bis 15, wobei der erste und der zweite Hohlraum (182, 181) an gegenüberliegenden Seiten der Zentriereinheit (18) vorgesehen sind und wobei die Schritte des Einsetzens des Verschlusselements (107) und des Einsetzens der Aufnahmebehälter (111) jeweils von gegenüberliegenden Seiten der Zentriereinheit (18) aus durchgeführt werden.

Revendications

1. Appareil pour appliquer un élément de fermeture (107) sur un corps de réceptacle (111) d'une cartouche, en particulier une cartouche pour cigarettes électroniques, comprenant :

- une ligne de transport (2) comprenant des supports (6) déplaçables le long de ladite ligne, qui sont chacun pourvus d'au moins un siège destiné à recevoir un corps de réceptacle (111), lesdits supports mobiles (6) transportant une pluralité de corps de réceptacles (111) le long de ladite ligne,
- une tête de préhension (12) destinée à prélever au moins un élément de fermeture (107) d'une ligne servant à apporter des éléments de fermeture (107) pour fermer lesdits corps de réceptacles (111) ;
- une unité de centrage (18) qui est placée dans un poste de capsulage dudit appareil,

où :

- lesdits supports (6) sont déplaçables le long d'un plan de référence (X, Y) pour porter lesdits corps de réceptacles (111) jusqu'à ladite unité de centrage (18) ;
- ladite tête de préhension (12) est déplaçable le long dudit plan de référence (X, Y) pour porter ledit au moins un élément de fermeture (107) jusqu'à ladite unité de centrage (18),
- ladite unité de centrage (18) est portée par une structure (190) qui place ladite unité de centrage (18) dans une position de travail qui est fixe, lorsqu'elle est définie par rapport audit plan de référence,

ladite unité de centrage comprenant des première et seconde cavités de centrage (182, 181), qui sont pourvues de surfaces de guidage (182A, 181A) conçues pour guider ledit corps de réceptacle (111) et ledit élément de fermeture (107), respectivement, de façon à les placer dans une position prédéterminée l'un vis-à-vis de l'autre, pour appliquer ledit élément de fermeture (107) sur ledit corps de réceptacle (111), par l'insertion dudit corps de réceptacle et dudit élément de fermeture respectivement dans lesdites première et seconde cavités (182, 181) ;
où lesdites première et seconde cavités (182, 181) sont alignées l'une avec l'autre le long d'un axe de référence (R) et communiquent l'une avec l'autre ;

- au moins un dispositif destiné à déplacer lesdits supports (6) et/ou ladite tête de préhension (12) et/ou ladite unité de centrage (18) pour insérer ledit corps de réceptacle (111) et ledit élément de fermeture (107) respectivement

- dans lesdites première et seconde cavités (182, 181), et pour amener ledit élément de fermeture (107) à un état accouplé avec ledit corps de réceptacle (111) à l'intérieur de ladite unité de centrage.
2. Appareil selon la revendication 1, dans lequel lesdites première et seconde cavités (182, 181) sont placées sur des côtés opposés de ladite unité de centrage (18).
3. Appareil selon l'une quelconque des revendications précédentes, dans lequel lesdites surfaces de guidage (182A, 181A) présentent une conformation conique.
4. Appareil selon l'une quelconque des revendications précédentes, dans lequel lesdites surfaces de guidage (182A, 181A) présentent chacune une conformation concave qui définit un axe coïncidant avec ledit axe de référence (R), et des sections transversales décroissant le long dudit axe (R), dans la direction allant vers l'autre surface.
5. Appareil selon l'une quelconque des revendications précédentes, dans lequel ladite unité de centrage (18) comprend une structure de base (183), et au moins une formation de blocs qui sont fixés sur ladite structure de base (183), qui comprend au moins un premier bloc et un second bloc (184), dans lequel lesdits premier et second blocs sont positionnés sur ladite structure de base selon un agencement relatif opposé et définissent conjointement lesdites première et seconde cavités (182, 181) ; dans lequel la position desdits premier et second blocs (184) peut être ajustée par rapport à ladite structure de base (183).
6. Appareil selon la revendication 5, dans lequel ledit premier bloc (184) délimite une première partie desdites première et seconde cavités (182, 181) et définit des parties correspondantes desdites surfaces de guidage (182A, 181A), et dans lequel ledit second bloc (184) délimite une seconde partie desdites première et seconde cavités et définit des parties correspondantes desdites surfaces de guidage (182A, 181A).
7. Appareil selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un dispositif de déplacement comprend un dispositif d'entraînement en mouvement (14) qui porte ladite tête de préhension (12) et est conçu pour déplacer ladite tête à l'intérieur d'un espace tridimensionnel (X, Y, Z).
8. Appareil selon l'une quelconque des revendications précédentes, comprenant une structure de support (190) qui porte ladite unité de centrage (18) et est conçue pour déplacer ladite unité le long d'une direction donnée (Z) pour insérer ledit corps de réceptacle (111) dans ladite première cavité (182) et l'en extraire.
9. Appareil selon l'une quelconque des revendications précédentes, dans lequel ladite tête de préhension (12) est conçue pour maintenir ledit élément de fermeture (107) contre un bord prédéfini de ladite tête par aspiration.
10. Appareil selon l'une quelconque des revendications précédentes, dans lequel
- ladite tête de préhension (12) comprend une pluralité d'unités de prélèvement (16) destinées à prélever une pluralité desdits éléments de fermeture (107),
 - ladite unité de centrage (18) est positionnée dans un poste de capsulage dudit appareil, et ladite ligne de transport (2) est conçue pour placer une pluralité de corps de réceptacles (111) simultanément dans ledit poste de capsulage,
 - ladite unité de centrage (18) comprend une pluralité d'organes de centrage, chacun comprenant lesdites première et seconde cavités (182, 181), destinés à agir simultanément sur ladite pluralité de corps de réceptacles (111) et d'éléments de fermeture (107).
11. Procédé d'application d'un élément de fermeture (107) sur un corps de réceptacle (111) d'une cartouche, en particulier une cartouche pour cigarettes électroniques, comprenant les étapes suivantes :
- faire avancer une pluralité de corps de réceptacles (111) le long d'une ligne de transport (2), lesdits corps (11) étant portés par des supports (6) qui sont déplaçables le long de ladite ligne ;
 - apporter une pluralité d'éléments de fermeture (107) pour fermer lesdits corps de réceptacles (111), le long d'une ligne d'apport (42) ;
 - prélever au moins un élément de fermeture (107) de ladite ligne d'apport, au moyen d'une tête de préhension (12) ;
 - disposer une unité de centrage (18) dans un poste de capsulage,
 - placer au moins un corps de réceptacle (111) dans le poste de capsulage en portant l'au moins un corps de réceptacle (111) jusqu'au dispositif de centrage (18) par le biais d'au moins un support (6) qui se déplace le long de ladite ligne de transport (2) et le long d'un plan de référence (X, Y) ;
 - porter l'au moins un élément de fermeture (107) jusqu'au dispositif de centrage (18) par le biais de la tête de préhension qui se déplace le long du plan de référence (X ; Y),

où ladite unité de centrage (18) est dans une position de travail qui est fixe, lorsqu'elle est définie par rapport audit plan de référence (X ; Y), portée par une structure (190),

ladite unité de centrage comprenant au moins une première et au moins une seconde cavité de centrage (182, 181), qui sont pourvues de surfaces de guidage (182A, 181A) conçues pour guider ledit corps de réceptacle (111) et ledit élément de fermeture (107) de façon à les placer dans une position prédéterminée l'un vis-à-vis de l'autre, pour appliquer ledit élément de fermeture (107) sur ledit corps de réceptacle (111), par l'insertion dudit corps de réceptacle (111) et dudit élément de fermeture (107) respectivement dans lesdites première et seconde cavités (182, 181), où lesdites première et seconde cavités sont alignées l'une avec l'autre le long d'un axe de référence (R) et communiquent l'une avec l'autre ;

ledit procédé comprenant :

- insérer ledit élément de fermeture (107) dans ladite seconde cavité de centrage (181) et, au moyen des surfaces de guidage correspondantes, guider l'élément de fermeture de façon à le placer dans la position prédéterminée vis-à-vis du corps de réceptacle ;

- insérer ledit corps de réceptacle (111) dans ladite première cavité de centrage (182) et, au moyen des surfaces de guidage correspondantes, guider le corps de réceptacle de façon à le placer dans la position prédéterminée vis-à-vis de l'élément de fermeture ;

- accoupler ledit élément de fermeture (107) avec ledit corps de réceptacle (111) à l'intérieur de ladite unité de centrage (18).

12. Procédé selon la revendication 11, dans lequel ladite étape consistant à insérer ledit élément de fermeture (107) dans ladite seconde cavité de centrage (181) comprend le fait de déplacer ladite tête de préhension (12) le long d'une direction (Z) qui est parallèle audit axe de référence (R) ou coïncide avec celui-ci, vers ladite unité de centrage (18).

13. Procédé selon la revendication 11 ou 12, dans lequel ladite étape consistant à insérer ledit corps de réceptacle (111) dans ladite première cavité de centrage (182) comprend le fait de déplacer ladite unité de centrage (18) le long d'une direction (Z) qui est parallèle audit axe de référence (R) ou coïncide avec celui-ci, vers ledit support mobile (6) qui porte ledit corps de réceptacle (111).

14. Procédé selon l'une quelconque des revendications 11 à 13, dans lequel ladite étape consistant à accoupler ledit élément de fermeture (107) avec ledit corps de réceptacle (111) comprend le fait de déplacer la-

dite tête de préhension (12) le long d'une direction (Z) parallèle audit axe de référence (R) ou qui coïncide avec celui-ci, vers ledit support mobile (6) qui porte ledit corps de réceptacle (111).

15. Procédé selon l'une quelconque des revendications 11 à 14, qui comprend le fait d'employer une seule tête de préhension (12) et dans lequel lesdites étapes consistant à prélever, placer, insérer et accoupler, s'appliquent simultanément à une pluralité de corps de réceptacles (111) et une pluralité d'éléments de fermeture (107).

16. Procédé selon l'une quelconque des revendications 11 à 15, dans lequel lesdites première et seconde cavités (182, 181) sont placées sur des côtés opposés de ladite unité de centrage (18), et dans lequel lesdites étapes consistant à insérer ledit élément de fermeture (107) et à insérer lesdits corps de réceptacles (111) sont respectivement exécutées depuis des côtés opposés de ladite unité de centrage (18).

FIG. 1

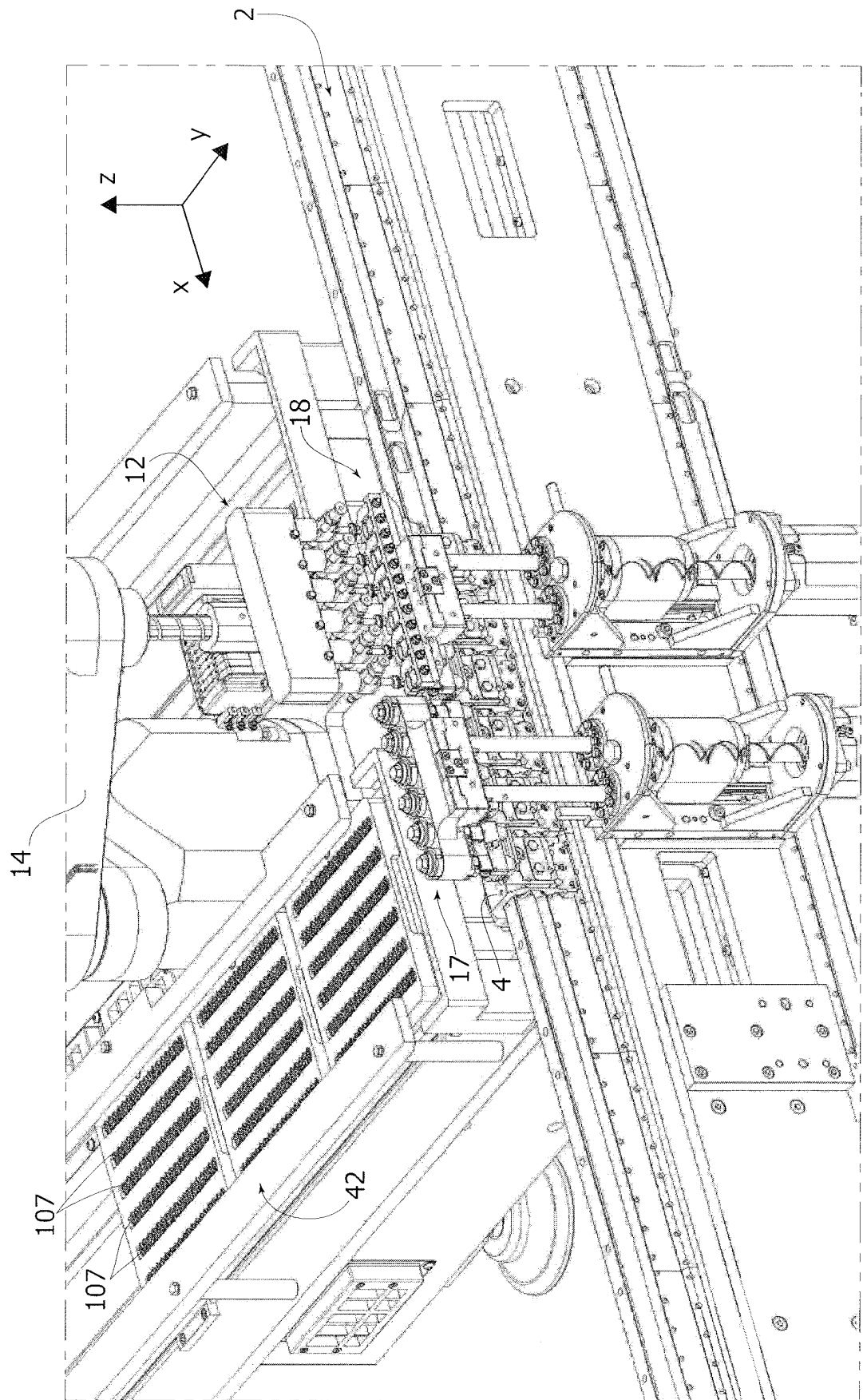


FIG. 2

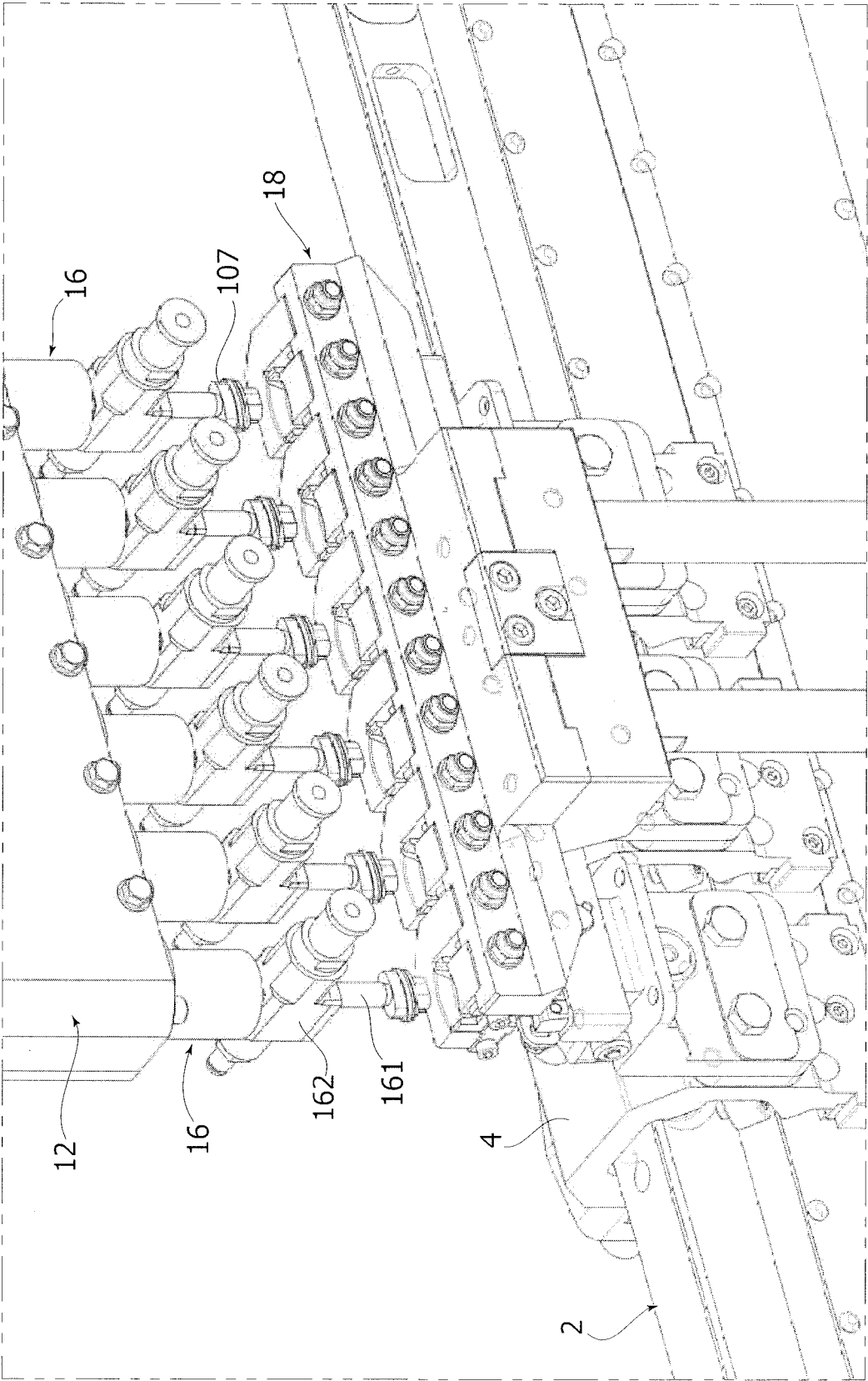


FIG. 3

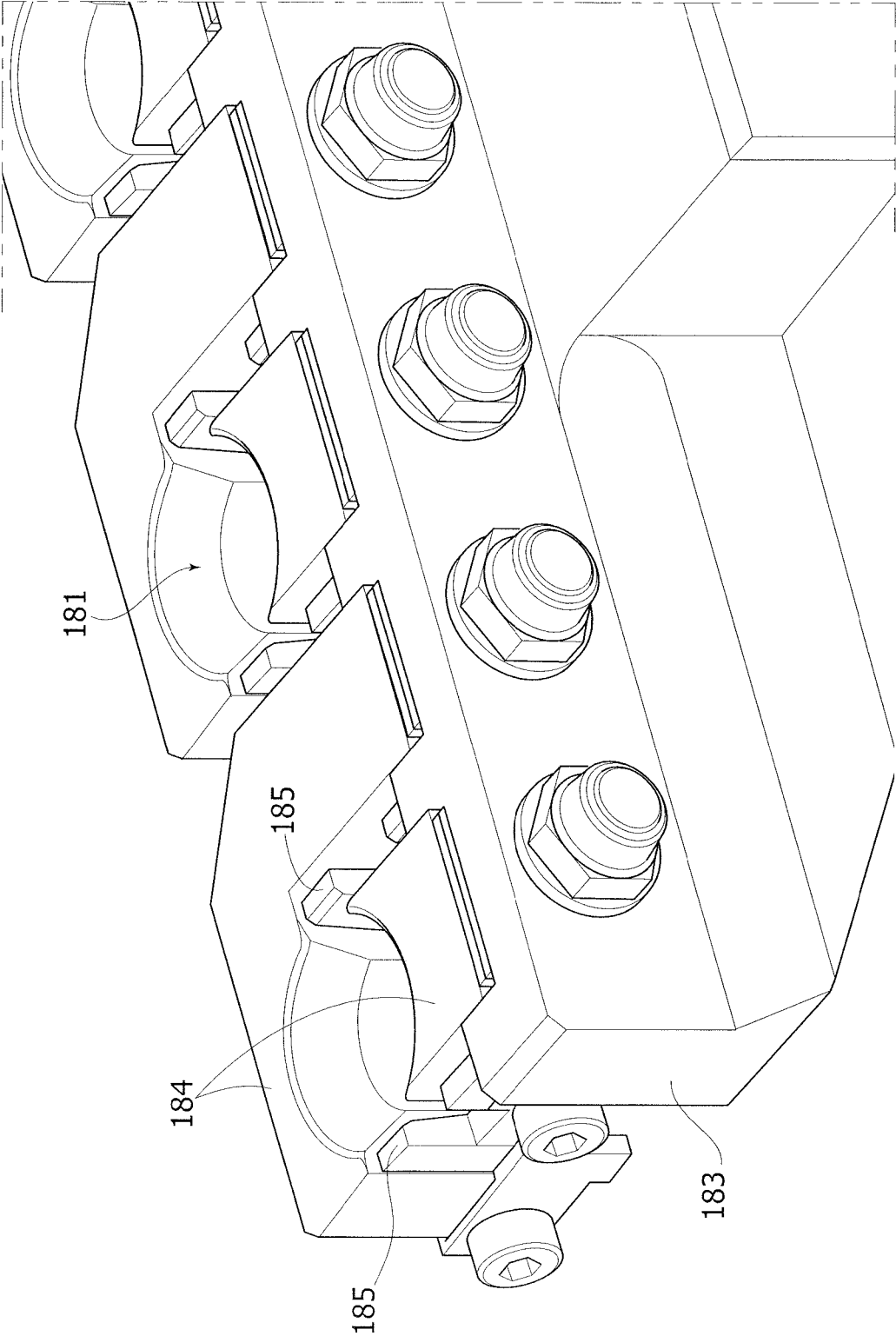


FIG. 4

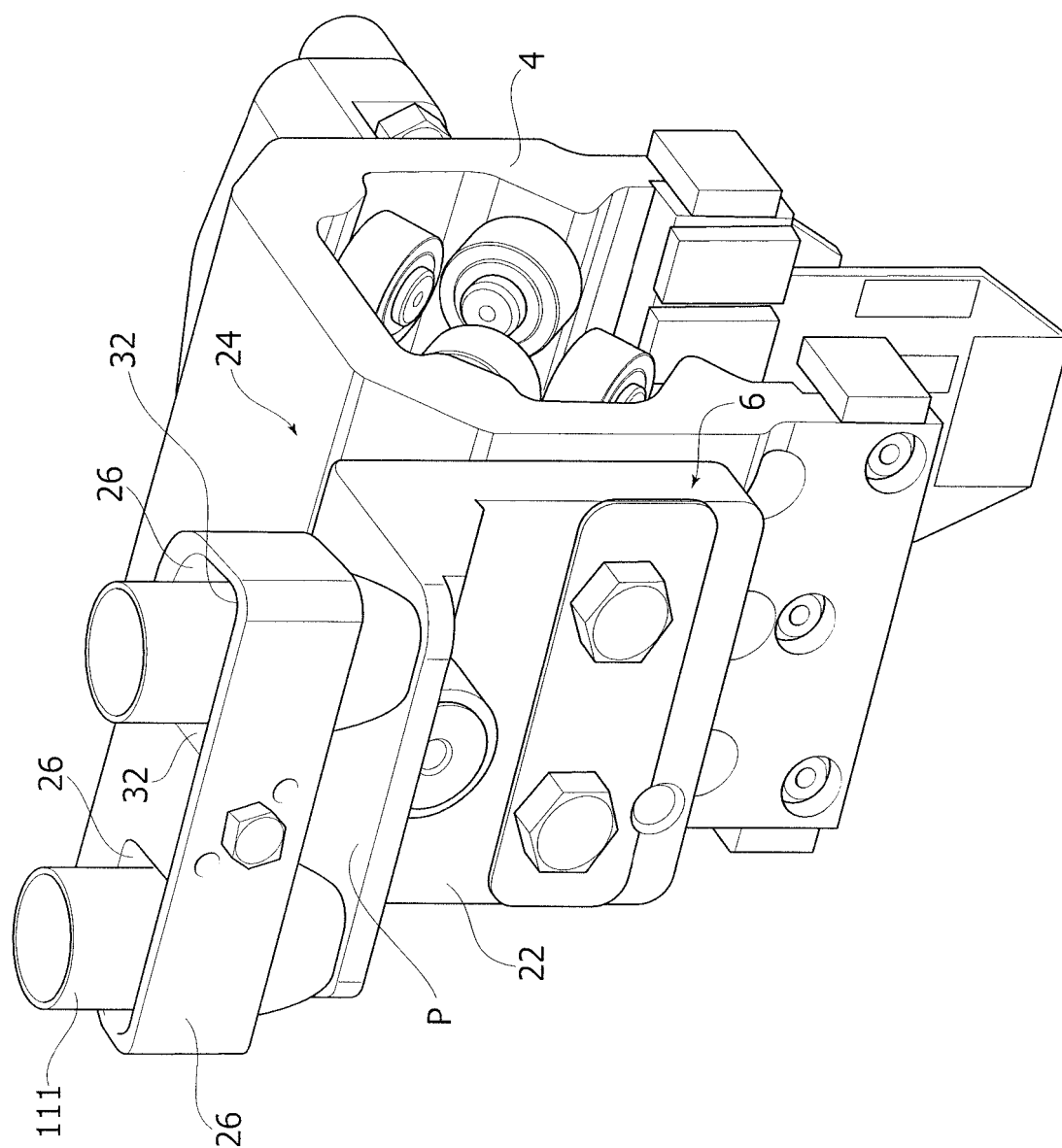


FIG. 5A

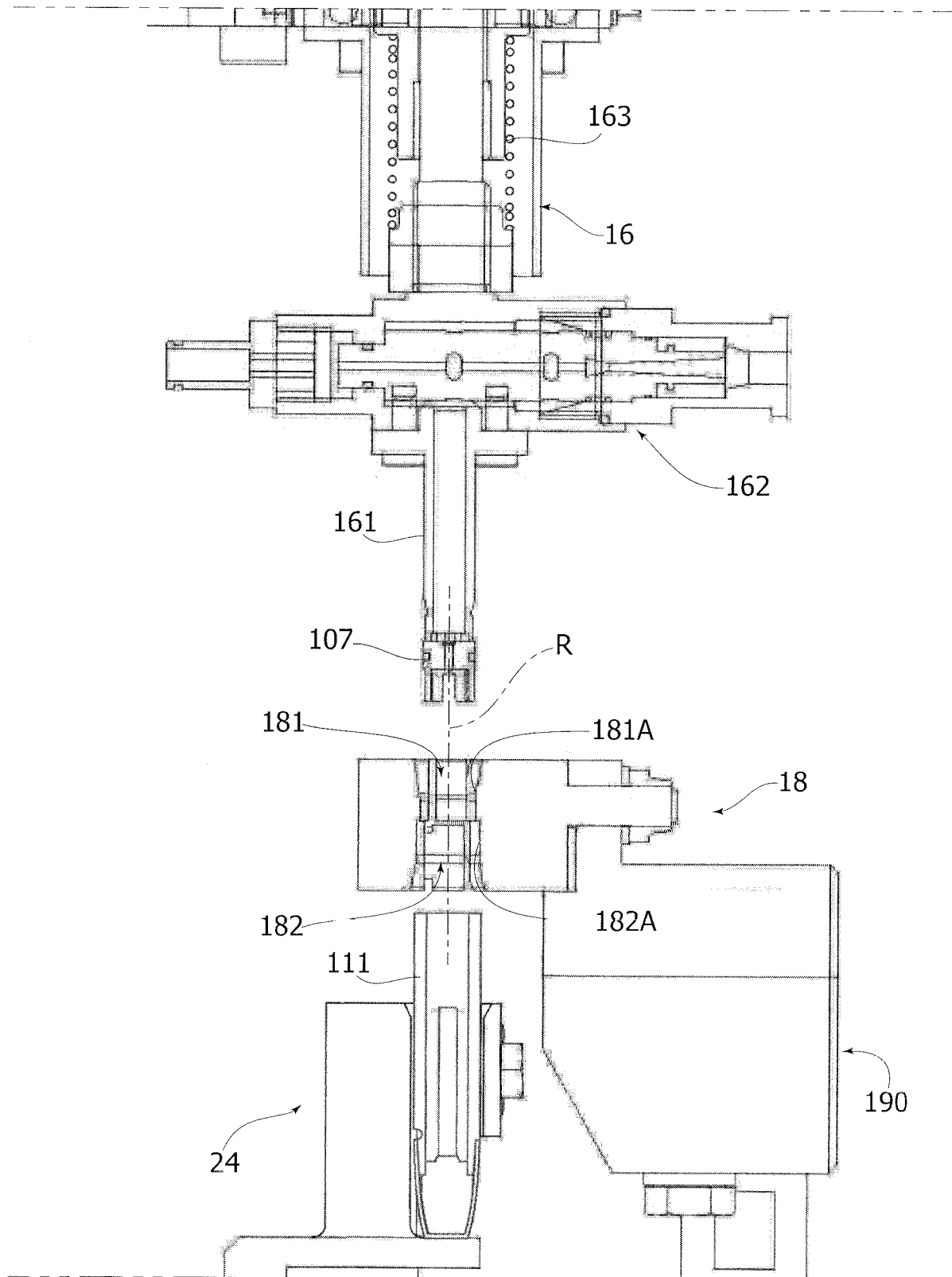


FIG. 5B

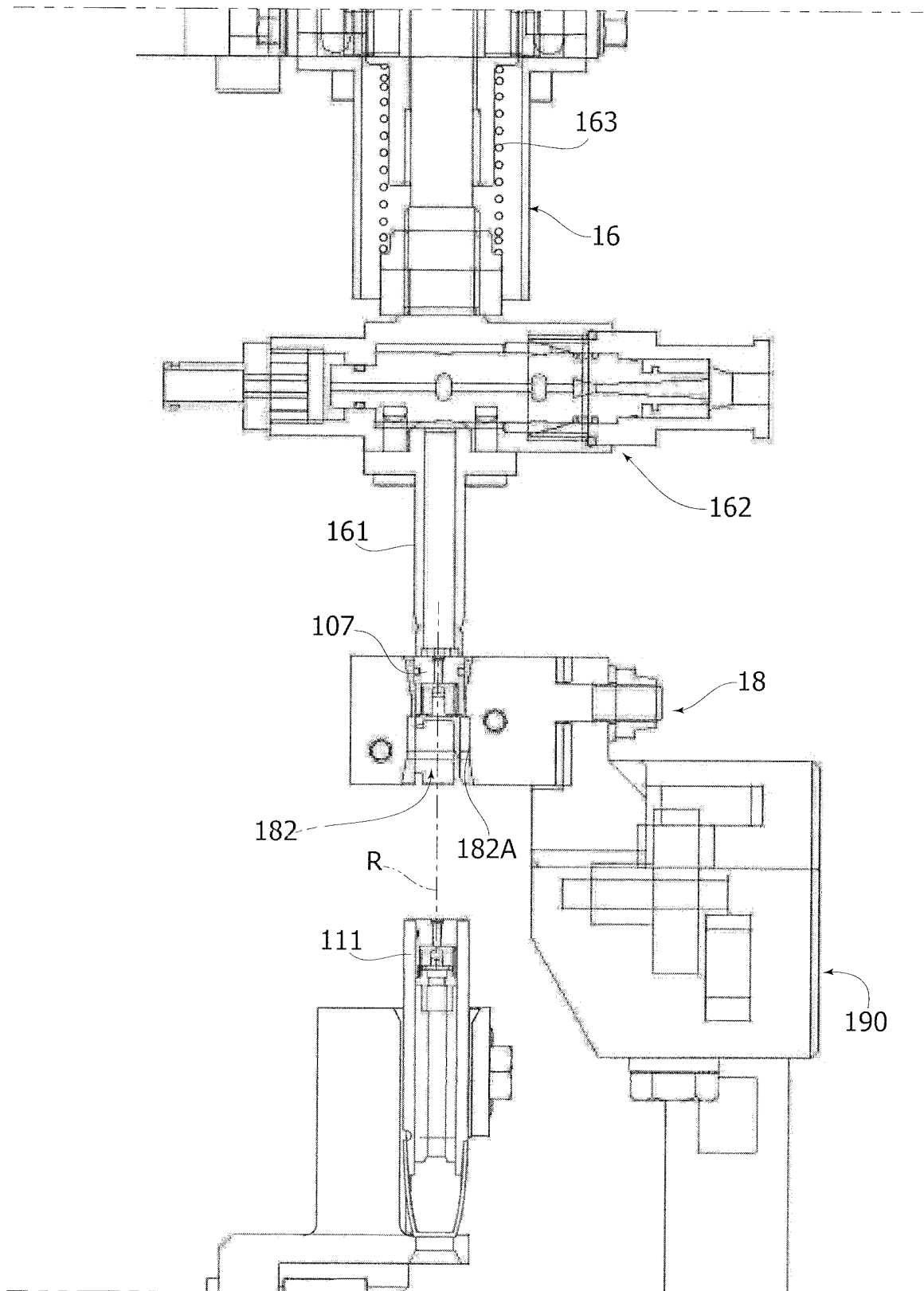


FIG. 5C

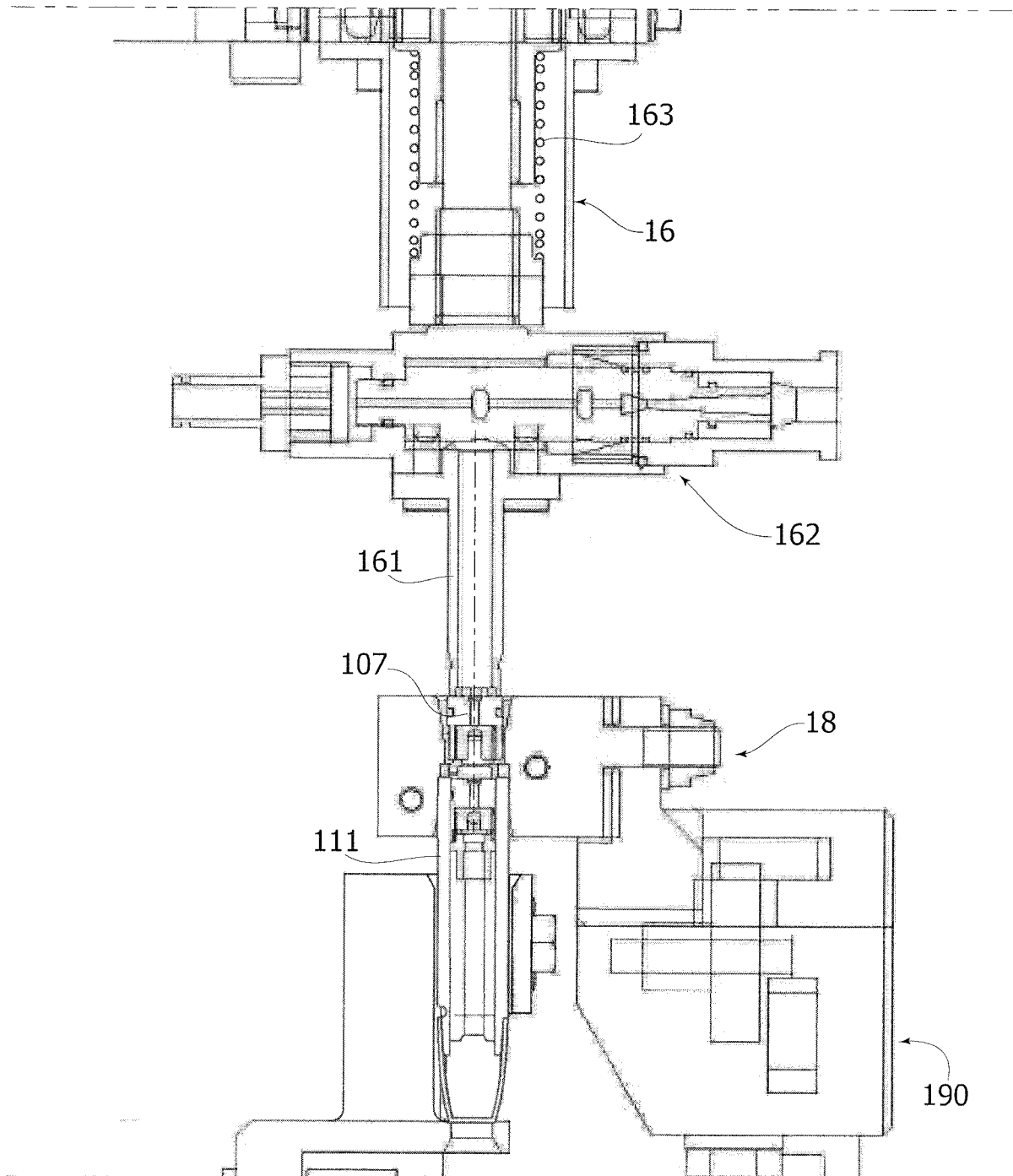


FIG. 5D

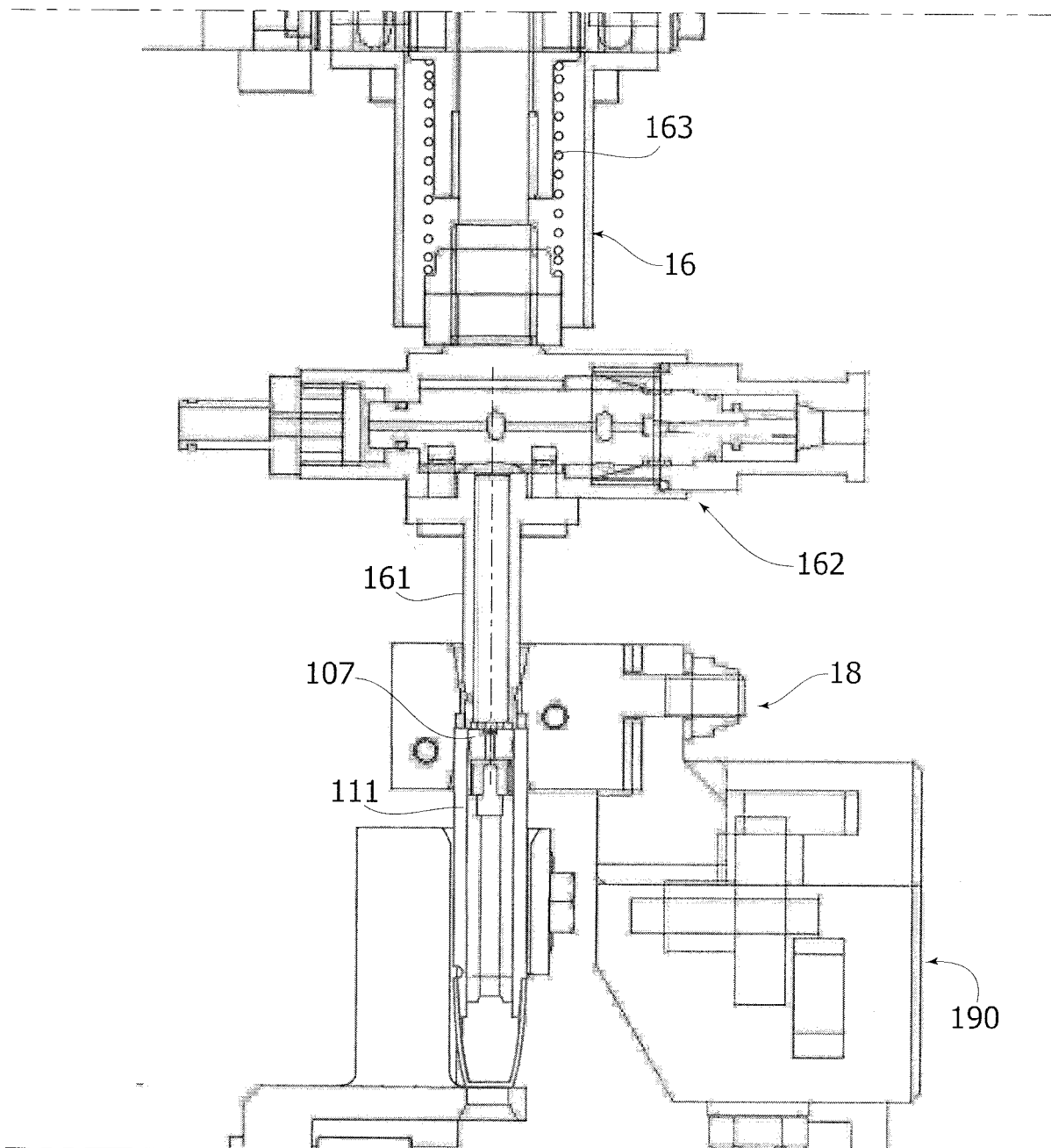


FIG. 5E

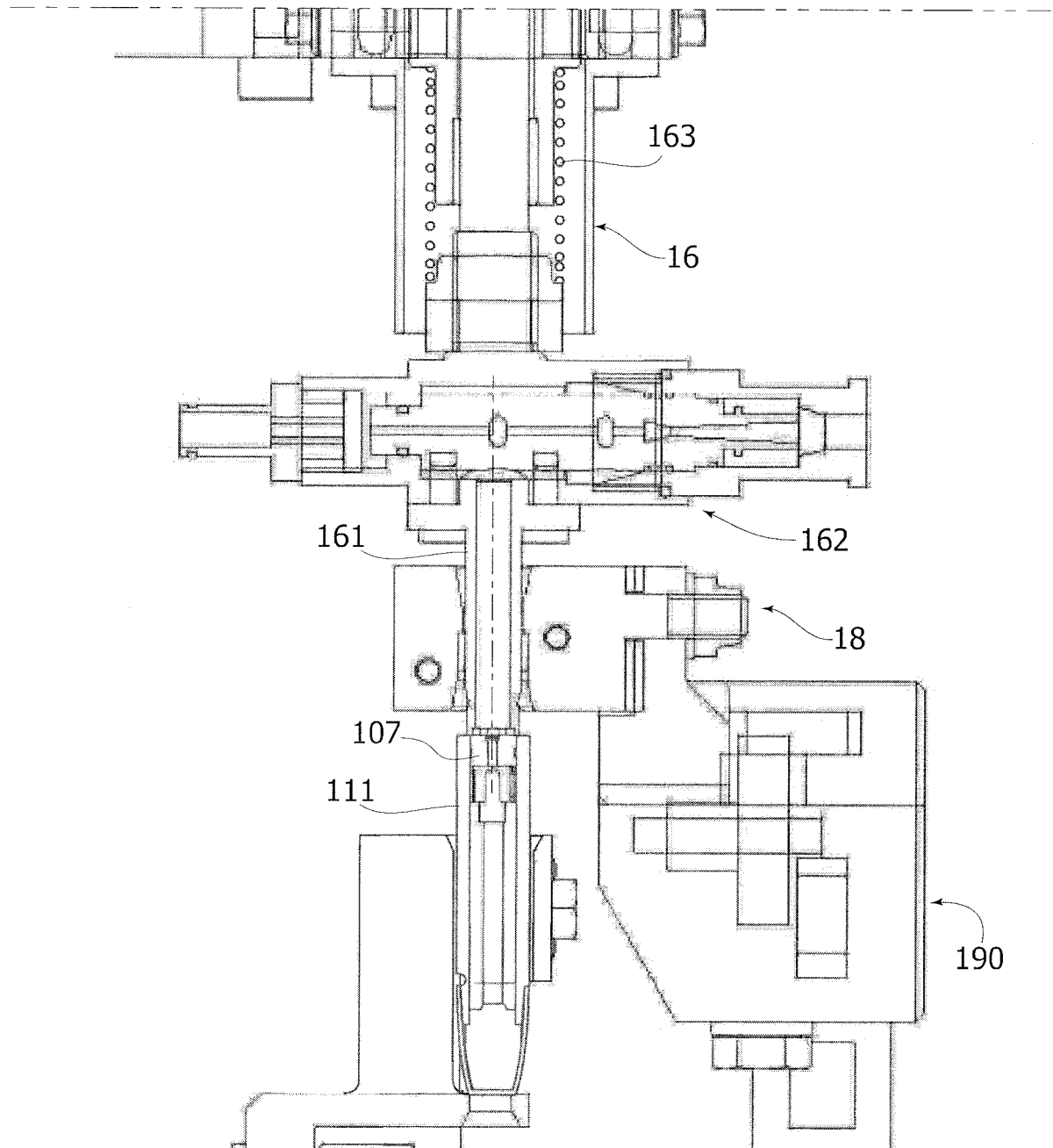
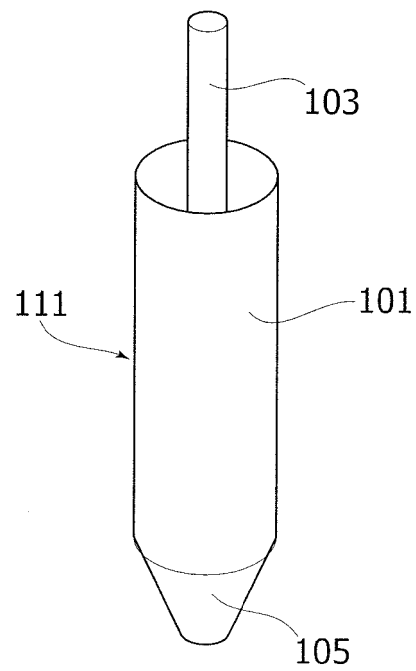
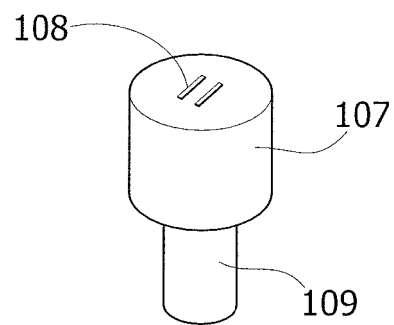


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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