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(54) **PUNCHING HEAD FOR AN APPARATUS FOR PRODUCING BRUSHES AND BROOMS WITH A VARIABLE -STROKE PUNCH**

STANZKOPF FÜR EINE VORRICHTUNG ZUR HERSTELLUNG VON BÜRSTEN UND BESEN MIT EINEM STANZER MIT VARIABLEM HUB

TÊTE DE POINÇONNAGE POUR UN APPAREIL DESTINÉ À FABRIQUER DES BROSSES ET DES BALAIS AU MOYEN D'UNE POINÇONNEUSE À FRAPPE VARIABLE

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Description

[0001] The present invention relates to an apparatus for producing brushes or brooms, with a punch with a variable stroke. Apparatuses are known for producing brushes or brooms that are essentially of two types.

[0002] A first type of apparatus comprises a supporting element consisting of a substantially horizontal plane supporting a plurality of bristle-holding bodies of brushes or brooms, a plurality of drilling tools for making holes in a surface of said bristle-holding bodies, holes suitable for receiving groups of bristles, and a plurality of punches that are movable in a substantially vertical direction, i.e. in a direction that is perpendicular to said plane, that is intended for inserting groups of bristles into the holes made on said surface of said bristle-holding bodies. The motion of each punch is between a first upper dead point position, in which the punch receives a group of bristles to be inserted into one of said holes of a bristle-holding body and a lower dead point position in which the punch inserts the group of bristles into a hole of said bristle-holding body. The plate that supports the bristle-holding bodies is movable along two axes X and Y parallel to the surface of the plane to carry the bristle-holding bodies from a position of insertion onto the plane to a boring position, at the boring tools, then to a bristle inserting position, at the insertion punches of the bristle units, and lastly to an unloading position, at the end of the operation of inserting the groups of bristles. The motion along the X and Y axes of said plane also varies the position of each bristle-holding body compared with the boring tools, during the boring operations, to enable said tools to make rows of holes that are substantially equally spaced on the bristle-holding body and to vary the position of said bristle-holding bodies with respect to the inserting punches of the groups of bristles, to position in succession the holes made in the bristle-holding body under the moving axis of the respective punch, during the operation of inserting groups of bristles into said holes.

[0003] The plate that supports the bristle-holding bodies is further movable parallel to an axis Z that is perpendicular to the plane defined by the axes X and Y and is rotatable around an axis U that is parallel to the plane defined by the axes X and Y. Motion in a parallel direction to the axis Z and around the axis U is used for positioning the bristle-holding bodies with respect to the boring tools and the punches, respectively to make holes and to insert groups of bristles, for example when the surface of the bristle-holding body is curved, or for making holes that are tilted with respect to the plane of the bristle-holding body and inserting groups of bristles into said tilted holes. The movement along the axis Z is also used to carry the plate that supports the bristle-holding bodies to a rest position when the apparatus is switched off and to reposition the plane when the apparatus is started up.

[0004] A second type of apparatus for producing brushes or brooms comprises a rotatable turret, on which the bristle-holding bodies are supported, around which are arranged, in successive positions along the circumference of the turret, a group of boring tools and a group of punches for inserting bristles.

[0005] EP 1 520 493, discloses a punching head for an apparatus for producing brushes or brooms, comprising at least one punch suitable for inserting groups of bristles into a brush or broom body and driving means of said punch, said driving means comprising a first connecting rod having a first end hinged on the punch, and a second end hinged on a first end of a crank driven to oscillate by an oscillator driven by the motor shaft of the apparatus. The oscillator determines the oscillation angle of the crank and the law of motion of the crank. The value of the oscillation angle and the law of motion of the crank are determined by a cam (not illustrated) interposed between the input shaft and the output shaft of the oscillator.

[0006] The oscillation angle of the crank has a fixed value depending on the geometry of the cam.

[0007] US 6 016 757 discloses an apparatus for producing brushes comprising a punch suitable for inserting groups of bristles into a brush body and driving means of said punch, said driving means comprising a rotating drive shaft, a cam on the drive shaft and a cam follower riding on the cam, A tufting device for the filling tool of a brush tufting machine is provided which permits the operating stroke of the filling tool to be varied and adjusted without affecting operating speed and precision of operation. The tufting device has a guide block, a guide channel in the guide block, a tuft driver tongue driven with a reciprocating movement and movably received in the guide channel, and a header having a through channel aligned with the guide channel. The header and guide block are driven with a relative reciprocating movement towards and away from each other. The device further has a drive system with a rotating drive shaft, a cam on the drive shaft and a cam follower riding on the cam, the cam follower being driven by the cam with a reciprocating movement of a predetermined stroke length. The cam follower is arranged at one end of a lever, the other end of which is pivotably mounted in an adjustable pivot mount. By adjusting the pivot mount via a conversion arm coupled to a linear guide the effective length of the lever is varied. A reciprocating drive rod, to which the punch is connected, carries an arm pivotably connected to the lever at a fixed spacing away from the cam follower The magnitude of the operating stroke of the drive rod and of the operating stroke of the punch depends on the effective length of the lever, i.e. on the position of the pivot mount. The operating stroke of the drive rod may be varied by adjusting the position of the pivot mount. However, adjusting the position of the pivot mount requires the apparatus to be stopped. In addition, the amplitude of variation of the drive stroke of the dive rod is physically limited by the stroke of the linear guide.

[0008] DE 29 31 363 discloses an apparatus for producing brushes or brooms, comprising at least one punch suitable for inserting groups of bristles into a brush or broom body. DE 29 31 363 any means for adjusting the

stroke of the punch.

[0009] DE 10 2007 003295 discloses a brush manufacturing machine which comprises a conveying device and machining stations arranged along the conveying device. The conveying device has conveying sections with a linear motor, which is developed for the transport of the brush bodies or brushes and their positioning with machining station. The machine further comprises at least one punch suitable for inserting groups of bristles into a brush or broom body. DE 10 2007 003295 does not disclose or suggest any means for adjusting the stroke of the punch.

[0010] One limit of known apparatuses for producing brushes and brooms is the stroke of the punch, i.e. of the distance travelled from the lower end of the punch between the upper dead point position, in which a group of bristles is inserted into the punch and the lower dead point position in which the punch comes into contact with the bristle-holding body to insert the group of bristles into a hole of said body.

[0011] This stroke determines the maximum usable length of the bristles of the groups of bristles.

[0012] In fact, as each group of bristles is inserted into the punch that is half folded, the stroke of the punch has to be equal to or slightly less than half the length of the group of bristle, in order to be able to extract the group of bristles from the punch, after it has been planted in the bristle-holding body.

[0013] Thus the maximum length of the bristles that can be used is equal to a little more than half the length of the punch stroke, for example about 125% of twice the punch stroke.

[0014] If brushes or brooms are required to be produced with groups of bristles of a length that is greater than the maximum length permitted by the apparatus, a new apparatus has to be acquired with a significant financial burden.

[0015] The present invention aims to supply an apparatus for producing brushes or brooms in which it is possible to vary the punch stroke in such a way as to be able to use a wide range of bristles of different length, such as to make the apparatus extremely flexible with a significant financial saving.

[0016] The object of the invention is achieved with an apparatus according to the attached claims.

[0017] Further advantages and features of the apparatus according to the invention will become clear from the description that follows that is made purely by way of non limiting example, wherein:

Figure 1 is a perspective view of a punching head according to the invention, for an apparatus for producing brushes or brooms;

Figure 2 is a further perspective view of the punching head in Figure 1;

Figure 3 is a perspective view of a detail of the punching head, that illustrates the action of the punch;

Figure 4 is a perspective view of a further detail of the punching head, that illustrates the operation of the thrusting device;

Figure 5 is a perspective view of a still further detail of the punching head, that illustrates the operation of the shearing device;

Figure 6 is a further perspective view that illustrates the operation of the shearing device;

Figure 7 is a perspective view of another detail of the punching head, that illustrates the operation of the inserting device of the bristles into the punch;

Figure 8 is a perspective view of a further detail of the punching head, which illustrates the operation of the bristle-separating device;

Figure 9 is a perspective view of a still further detail of the punching head, that illustrates the operation of the dragging device of the wire used for fixing the groups of bristles on a brush or broom body;

Figure 10 is the section X-X of Figure 9;

Figure 11 is a perspective view of another detail of the punching head, that illustrates the operation of the wire-shaping device;

Figure 12 illustrates a version of the punching head according to the invention;

Figure 13 is a diagram of a command and control device that coordinates the operation of the devices of the punching head according to the invention;

Figure 14 is a diagram like the one in Figure 13, relating to a version of the command and control device.

[0018] In Figure 1 there is illustrated a punching head 1 according to the present invention, for an apparatus for producing brushes or brooms that may comprise one or more punching heads 1. The punching head 1 is provided with a punch 2, by means of which groups of bristles are fixed to a brush or broom body.

[0019] The punch 2 comprises a punch head 3 by means of which a group of bristles (not shown) is inserted into a brush or broom (not shown). The head 3 of the punch 2 is fixed to a punch body 4 (Figure 3) vertically slidable in a guiding element 5. To the punch body 4 a first end 6a of a first connecting rod 6 is hinged, a second end of which 6b is hinged on a first crank 7, rotated by a first motor 8, for example a brushless electric motor. The motor 8, first crank 7 and first connecting rod 6 set constitute first driving means that commands vertical sliding of the punch body 4, guided by the guiding element 5. By varying, via the motor 8, the oscillating angle α of the first crank 7 it is possible to vary the stroke of the punch 2 to adapt the stroke to the various lengths of the groups of bristles to be inserted into the body of a brush or broom.

[0020] With the punch 2 a thrust element 9 is associated (Figure 4) that is guided to slide inside the guiding body 5 and the head 3 of the punch 2. The groups of bristles are pushed by the thrust element 9 through the head 3 of the punch 2 to be then inserted into the body of a brush or broom and fixed therein by a fixing element (not shown). The fixing element can be constituted by a

portion of metal wire F that is folded in an arc above a corresponding group of bristles and is inserted by the thrust element 9, together with the group of bristles, in the body of a brush or broom. Alternatively, the fixing element may consist of a portion of metal strap that is inserted aligned on an edge into the body of a brush or broom, together with the group of bristles. The thrust element 9 is driven by second driving means 10, 11, 12, 13, 14 that comprises a slide element 10, to which is fixed an end of the thrust element 9, said slide element 10 being slidable along vertical guides 11 associated with the punching head 1. To the slide element 10 a first end 12a of a second connecting rod 12 is hinged, a second end of which 12b is hinged on a second crank 13, rotated by a second motor 14, for example a brushless electric motor.

[0021] The stroke of the thrust element 9 can be adjusted to adapt to the stroke of the punch 2, by varying the length of the crank arm of the crank 13. For this purpose, on the crank 13 pairs of holes 100, 101 are provided into which fixing elements 102 are inserted, for example of the fixing screws, by means of which crank 13 can be fixed to a flange 103 connected to the drive shaft of the second motor 14. Each pair of holes 100, 101 is matched by a different length of the crank arm of the crank 13 and consequently, a different stroke of the thrust element 9. Alternatively, the variation in the stroke of the pusher can be obtained by driving the crank 13, via the second motor 14, with reciprocating movement with a variable rotation angle.

[0022] The punching head 1 further comprises a shearing device 18 driven by third driving means 15, 16, 17 that comprises a third motor 15 (Figure 5), for example a brushless electric motor, that drives a third crank 16, on an end of which is hinged a first end 17a of a third connecting rod 17, a second end of which 17b is hinged on the shearing device 18 (Figure 6). The shearing device 18 is used to shear from a continuous metal wire F comes from a supply reel, that is not shown, a portion of metal wire that is intended to constitute the fixing element of a group of bristles.

[0023] The aforesaid wire F is unwound from the supply reel and pushed inside the guiding element 5 by a dragging device 20 (Fig. 10), which comprises an active dragging element 21a consisting, for example, of a first knurled wheel, driven by a fourth motor 22, for example a brushless electric motor, and a contrasting element 21b, which also consists, for example, of a second knurled wheel mounted idling on a supporting element 104 hinged in 105 on the punching head 1 and in 106 on the stem 107 of an operating cylinder 108, fixed to the punching head 1. By driving the operating cylinder 108, it is possible to vary the pressure of the contrasting element 21b on the wire F, to ensure that the wire F is dragged without slipping by the active dragging element 21a. Further, by means of the operating cylinder 108 it is possible to lift the contrasting element 21b, to proceed with the insertion of a new wire F into the dragging element 20, when the reel of wire F has finished or when necessary for processing needs, to replace the wire F with another of different dimensions or type. The wire F, as it travels between the supply reel and the guiding element 5, is guided by guiding elements 109, 110.

[0024] A fifth motor 23 (Figure 7), for example a brushless electric motor, drives, via a fourth crank 24, an inserting device 25, of known type, that removes the groups of bristles from a magazine 36 (Figure 1) and inserts the groups of bristles into a head 3 of the punch 2.

[0025] A sixth motor 27 (Figure 8), for example a brushless electric motor, drives a fifth crank 28, on an end of which is hinged a first end 29a of a fourth connecting rod 29, a second end of which 29b is hinged on a further supporting element 111, which supports a bristle-separating device 30, which extracts the clumps of bristles from the head 3 of the punch 2, after they have been fixed to the body of a brush or broom. The further supporting element 111 is in turn hinged on a supporting plate 112 fixed to the frame of the punching head 1. The connection of the fourth connecting rod 29, to the fifth crank 28 and to the further supporting element 111 is made in such a way that the bristle-separating device 30, when the fifth crank 28 is rotated by the sixth motor 27, oscillates on a plane that is perpendicular to the plane in which the inserting device 25 moves. Alternatively, the fourth connecting rod 29 can be connected to the fifth crank 28 and to the further supporting element 111 in such a manner that the bristle-separating device 30 oscillates on a plane parallel to the plane in which the inserting device 25 moves.

[0026] Lastly, a seventh motor 31 (Figure 11), for example a brushless electric motor, drives a sixth crank 32, on an end of which is hinged a connecting rod 33 on which a clamp element 34 is fixed to which a shaping element 35 is fixed in turn. By driving the crank 32, the shaping element 35 can be inserted into or extracted from the guiding element 5. The movement of the shaping element 35 between a position of insertion into the guiding element 5 and a position of extraction from the guiding element 5 is small, so also the angle of rotation that the crank 32 has to perform to move the shaping element 35 from said insertion position and said extraction position is small. Accordingly, the shaping element 35, between said insertion position and said extraction position, it moves in a direction that is substantially perpendicular to the axis of the punch 2. The shaping element 35 acts as a contrasting element to shape in an arc shape a portion of wire F inserted into the guiding element 5, when the shearing device 18 separates the portion of wire from the rest of the wire F.

[0027] In Figures 1 and 2 a magazine 36 is illustrated for groups of bristles intended for being inserted into a brush or broom body by the punch 2. The magazine 36 fixed to the punching head 1 comprises a body 37 inside which there are obtained a first supply channel 38 of the groups of bristles and a second supply channel 39 of the groups of bristles, which are superimposed on one an-

other, from which the inserting device 25 removes the groups of bristles to insert the groups of bristles into the body 4 of the punch 2. On the body 37 of the magazine 36 the stem 41 of an operating cylinder 40 is hinged, the body 42 of which is hinged on the punching head 1. The operating cylinder 40 is used to raise and lower the magazine 36 to enable the inserting device 25 to remove the clumps of bristles from the first supply channel 38, or from the second supply channel 39.

[0028] In figure 12 there is illustrated a version Ia of the punching head in which the first, second, third and sixth motor, which respectively drive the punch 2, the thrust element 9, the shearing device 18 and the bristle-separating device 30 are linear motors.

[0029] The first motor 43, which drives the punch 2, is a linear motor that comprises a first slider 44, to which the second end 6b of the first connecting rod 6 is fixed that drives the punch 2, and a first sliding guide 45 on which the first slider 44 is slidable.

[0030] The sliding of the first slider 44 along the first sliding guide 45 determines corresponding sliding of the first connecting rod 6 and, consequently, of the punch 2, in a substantially vertical direction. By varying the stroke of the first slider 44 along the first sliding guide 45 the stroke of the punch 2 is varied.

[0031] The second motor 46, which drives the thrust element 9, is a linear motor that comprises a second slider 47, to which the second end 12b of the second connecting rod 12 is connected, which drives the thrust element 9, and a second sliding guide 48 on which the second slider 47 is slidable. By varying the stroke of the second slider 47 along the second sliding guide 48 the stroke of the thrust element 9 is varied.

[0032] The third motor 49, which drives the shearing device 18, is a linear motor that comprises a third slider 50, to which the first end 17a of the third connecting rod 17 is fixed that drives the shearing device 18, and a third sliding guide 51 on which the third slider 50 is slidable.

[0033] The sixth motor 52 that drives the bristle-separating device 30 is a linear motor that comprises a fourth slider 53, to which the first end 29a of the fourth connecting rod 29 that the supporting element 111 to which the bristle-separating device 30 is fixed, and a fourth sliding guide 54 on which the fourth slider 53 is slidable. The motion of the fourth slider 53 on the fourth sliding guide 54 determines the oscillation of the further supporting element 111 that carries the bristle-separating device 30.

[0034] The adjustment of the punch 2 stroke, of the thrust element 9, of the bristle-separating device 30 and of the inserting device 25 of the groups of bristles and the synchronisation of the punch 2 movements, of the thrust element 9, of the shearing device 18, of the bristle-separating device 30, of the element 20 for dragging the wire F, of the inserting device 25 of the groups of bristles and of the shaping element 35 can be made by an electronic command and control system 200, 201 (Figures 13 and 14) that controls the drives of the first motor 8; 43, of the second motor 14; 46, of the third motor 15; 49, of the fourth motor 22, of the fifth motor 23, of the sixth motor 27; 52 and of the seventh motor 31.

[0035] The electronic command and control system can be provided with software programmes for driving and synchronising the aforesaid motors, in function, for example, of the stroke of the punch 2 established on the basis of the length of the groups of bristles to be inserted into the body of a brush or broom, of the degree of the bristles used, of the resistance to extraction that is required for the groups of bristles after they have been inserted into the body of the brush or broom, of the shearing speed of the shearing device 18, which depends on the section of the wire F, or of the strap used to fix the groups of bristles in the body of the brush or broom, of the shape of the surface, for example flat or convex, of the brush or broom body into which the groups of bristles have to be inserted, which may require variations in the punch stroke as the position, into which the groups of bristles in said body are inserted, varies. The command and control system 200, 201 acts in such a way as to adjust and synchronise reference positions, reciprocal steps and laws of the punch motion 2, of the thrust element 9, of the shearing device 18, of the bristle-separating device 30, of the inserting device 25 of the groups of bristles in the punch 2, of the dragging device 20 for dragging the wire F, or strap, and of the shaping element 35, such that all the aforesaid devices and elements operate in a co-ordinated manner on the basis of the desired operating specifications.

[0036] If in one of the aforesaid devices and elements, a deviation of the motion law established therefore should occur, for example owing to wear, the command and control system slows all the other devices and elements or adapts the motion laws thereof, to compensation for the aforesaid deviation.

[0037] A significant advantage of the apparatus according to the invention is the possibility of varying the reciprocal position and synchronisation of the aforesaid devices and elements by using the command and control system 200, 201, without having to perform mechanical adjustments on the apparatus.

[0038] In Figure 13, there is illustrated an embodiment of the command and control system 200 of the so-called 'distributed intelligence system'. In this embodiment, the first motor 8, 43, which drives the punch 2, is driven by a first command and control device P, the second motor 14; 46, which drives the thrusting device 9, is driven by a second command and control device L, the third motor 15; 49, which drives the shearing device 18, is driven by a third command and control device Tr, the fourth motor 22, which drives the dragging device 20 for dragging the wire F, or strap, is driven by a fourth command and control device K, the fifth motor 23, which drives the inserting device 25 of the groups of bristles nel punch 2, is driven by a fifth command and control device A, the sixth motor 27, 52, which drives the bristle-separating device 30, is driven by a sixth command and control device S and the seventh motor 31, which drives the shaping element 35,

is driven by a seventh command and control device Q.

[0039] All the aforesaid command and control devices are connected to one another in such a way that each command and control device can be related to and synchronised with the other devices.

[0040] Any one of the command and control devices can be designed to take on a function of primary command and control device that manages and coordinates the other command and control devices.

[0041] In Figure 14 another embodiment of the command and control system is illustrated, a so-called 'centralised intelligence' command and control system that differs from the embodiment illustrated in Figure 13 through the fact that the individual command and control devices, instead of being connected to one another, are connected to a central command and control device M that manages and coordinates all the single command and control devices. The central command and control device M can be, for example, a data-processing system that is outside the apparatus according to the invention and is connectable thereto, or can be integrated into the apparatus according to the invention.

Claims

1. Punching head (1) for an apparatus for producing brushes or brooms, comprising at least one punch (2) suitable for inserting groups of bristles into a brush or broom body and driving means (6, 7, 8) of said punch (2), said driving means (6, 7, 8) being structured for being able to vary a stroke of said punch (2), said driving means (6, 7, 8) comprising a first connecting rod (6) having a first end (6a) hinged on a body (4) of the punch (2), said body (4) being guided to slide in a guiding body (5), and a second end (6b) hinged on a first crank (7), said first crank (7) being driven to oscillate by a first motor (8), said stroke of the punch (2) being proportional to an oscillation angle (α) of said first crank (7), **characterized in that** said oscillation angle (α) is varied by said first motor (8).

2. Punching head (1) according to claim 1, wherein said first motor (8) is a brushless electric motor.

3. Punching head (1) for an apparatus for producing brushes or brooms, comprising at least one punch (2) suitable for inserting groups of bristles into a brush or broom body and driving means (6, 43, 44, 45) of said punch (2), said driving means (6, 43, 44, 45) being structured for being able to vary a stroke of said punch (2), said driving means (6, 43, 44, 45) comprising a first connecting rod (6) having a first end (6a) hinged on a body (4) of the punch (2), said body (4) being guided to slide in a guiding body (5), and a second end (6b) connected to a first motor (43), **characterized in that** said first motor (43) is a linear motor comprising a first slider (44) that is slidable on a first sliding guide (45), said second end (6b) being hinged on said first slider (44), wherein the stroke of said punch (2) is varied by varying the stroke of said first slider (44) along said first sliding guide (45).

4. Punching head (1) according to any one of claims 1 to 3, further comprising a thrust element (9) guided to slide in said guiding body (5) and in a head (3) of said punch (2), said thrust element (9) being suitable for pushing said groups of bristles through said punch (2) and for inserting the groups of bristles into a brush or broom body, said thrust element (9) being driven by second driving means (10, 11, 12, 13, 14; 46, 47, 48) structured so as to be suitable for varying a stroke of said thrust element (9).

5. Punching head (1) according to claim 4, wherein said second driving means (10, 11, 12, 13, 14) comprises a slide element (10), to which is fixed an end of the thrust element (9), said slide element (10) being slidable along vertical guides (11), on the slide element (10) there being hinged a first end (12a) of a second connecting rod (12), a second end (12b) of which is hinged on a second crank (13), rotated by a second motor (14), the stroke of said thrust element (9) being able to be varied by operating said crank (13), by said second motor (14), with reciprocating movement with a variable rotation angle.

6. Punching head (1) according to claim 4, wherein said second driving means (10, 11, 12, 13, 14) comprises a slide element (10), to which is fixed an end of the thrust element (9), said slide element (10) being slidable along vertical guides (11), on the slide element (10) there being hinged a first end (12a) of a second connecting rod (12), a second end (12b) of which is hinged on a second crank (13), rotated by a second motor (14), the length of the crank arm of said second crank (13) being adjustable to adjust the stroke of said thrust element (9).

7. Punching head (1) according to claim 6, wherein said crank (13) is provided with pairs of holes (100, 101) in which fixing elements (102) are insertible by means of which the crank (13) can be fixed to a flange (103) connected to the drive shaft of the second motor (14).

8. Punching head (1) according to any one of claims 5 to 7, wherein said second motor (14) is a brushless electric motor.

9. Punching head (1) according to claim 4, wherein said second driving means (10, 11, 12, 46, 47, 48) comprises a slide element (10), to which is fixed an end of the thrust element (9), said slide element (10) be-

ing slidable along vertical guides (11), on the slide element (10) there being hinged a first end (12a) of a second connecting rod (12), a second end (12b) of which is connected to a second motor (46), said second motor (46) being a linear motor comprising a second slider (47) that is slidable on a second sliding guide (46), said second end (12b) being hinged on said second slider (47).

10. Punching head (1) according to any one of claims 1 to 9, further comprising a shearing device (18) suitable for shearing from a continuous metal wire (F), or from a continuous metal strap, coming from a supplying reel, a portion of wire or strap intended for constituting a fixing element of a group of bristles in said brush or broom body, said shearing device (18) being driven by third driving means (15, 16, 17) that comprises a third motor (15), that drives a third crank (16), on an end of which is hinged a first end (17a) of a third connecting rod (17), a second end of which (17b) is hinged on the shearing device (18).

11. Punching head (1) according to claim 10, wherein said third motor (15) is a brushless electric motor.

12. Punching head (1) according to any one of claims 1 to 9, further comprising a shearing device (18) suitable for shearing from a continuous metal wire (F), or from a continuous metal strap, coming from a supplying reel of a portion of wire or strap intended for constituting a fixing element of a group of bristles in said brush or broom body, said shearing device (18) being driven by third driving means (17, 49, 50, 51) that comprises a third connecting rod (17) a first end (17a) of which is connected to a third motor (49) and a second end of which (17b) is hinged on the shearing device (18), said third motor (49) being a linear motor (49) comprising a third slider (50), on which said second end is hinged, and a third sliding guide (51) on which said third slider (50) is slidable.

13. Punching head (1) according to any one of claims 10 to 12, further comprising a dragging device (20) that is suitable for unwinding said metal wire (F) from said supplying reel and pushing the metal wire (F) inside said guiding element (5), said dragging device comprising an active dragging element (21a) driven by a fourth motor (22) and a contrasting element (21b) that is suitable for pressing said metal wire (F) on said active dragging element (21a).

14. Punching head (1) according to claim 13, wherein said fourth motor (22) is a brushless electric motor.

15. Punching head (1), according to any preceding claim, further comprising a device (25) for inserting said groups of bristles in said punch (2), said inserting device (25) being driven by a fifth motor (23) via a fourth crank (24).

16. Punching head (1) according to claim 15, wherein said fifth motor (23) is a brushless electric motor.

17. Punching head (1) according to any preceding claim, further comprising a bristle-separating device (30) fixed to a supporting element (111) hinged on a supporting plate (112) and on a second end (29b) of a fourth connecting rod (29) the first end (29a) of which is hinged on a fifth crank (28) driven by a sixth motor (27).

18. Punching head (1) according to claim 17, wherein said sixth motor (27) is a brushless electric motor.

19. Punching head (1) according to any one of claims 1 to 16, further comprising a bristle-separating device (30) fixed to a supporting element (111) hinged on a supporting plate (112) and on a second end (29b) of a fourth connecting rod (29) the first end (29a) of which is connected to a sixth motor (52), said sixth motor (52) being a linear motor comprising a fourth slider (53), on which said first end (29a) is hinged, and a fourth sliding guide (54) on which said fourth slider (53) is slidable.

20. Punching head (1) according to any one of claims 10 to 19, further comprising a shaping element (35) that is suitable for shaping a portion of said metal wire (F) sheared by said shearing device (18) to obtain said fixing element, said shaping element (35) being insertible into and extractable from said guiding body (5), said shaping element (35) being fixed to a clamp element (34), fixed in turn to a sixth crank (32) driven by a seventh motor (31).

21. Punching head (1) according to claim 20, wherein said seventh motor (31) is a brushless electric motor.

22. Punching head (1) according to claim 20 or 21, **characterised in that** it is associated with a command and control system (200; 201) suitable for commanding, coordinating and synchronising the driving of said first motor (8; 43), of said second motor (14; 46), of said third motor (15; 49), of said fourth motor (22), of said fifth motor (23), of said sixth motor (27; 52) and of said seventh motor (31).

23. Punching head (1) according to claim 22, wherein said command and control system (200; 201) comprises at least one command and control device (P; L; Tr; K; A; S; Q) operationally connected to at least one of said first motor (8; 43), second motor (14; 46), third motor (15; 49), fourth motor (22), fifth motor (23), sixth motor (27; 52) seventh motor (31).

24. Punching head (1) according to claim 23, wherein

said command and control system (200; 201) comprises a first command and control device (P) operationally connected to said first motor (8; 43), a second command and control device (L) operationally connected to said second motor (14; 46), a third command and control device (Tr) operationally connected to said third motor (15; 49), a fourth command and control device (K) operationally connected to said fourth motor (22), a fifth command and control device (A) operationally connected to said fifth motor (23), a sixth command and control device (S) operationally connected to said sixth motor (27; 52) and a seventh command and control device (Q) operationally connected to said seventh motor (31).

25. Punching head (1) according to claim 24, wherein said command and control devices (P; L; Tr; K; A; S; Q) are operationally connected together.

26. Punching head (1) according to claim 24, wherein each of said command and control devices (P; L; Tr; K; A; S; Q) is operationally connected to a central command and control device (M).

27. Apparatus for producing brushes or brooms, **characterised in that** it comprises one or more punching heads according to any one of claims 1 to 26.

Patentansprüche

1. Stanzkopf (1) für eine Vorrichtung zum Herstellen von Bürsten oder Besen, mit zumindest einer Stanze (2), die zum Einsetzen von Gruppen von Borsten in einen Bürsten- oder Besenkörper geeignet ist, und Antriebsmitteln (6, 7, 8) der Stanze (2), wobei die Antriebsmittel (6, 7, 8) eine Struktur aufweisen, um einen Hub der Stanze (2) variieren zu können, wobei die Antriebsmittel (6, 7, 8) eine erste Stange (6) aufweisen, die ein erstes Ende (6a), das an einem Körper (4) der Stanze (2) angelenkt ist, wobei der Körper (4) in einem Führungskörper (5) gleitend geführt ist, und ein zweites Ende (6b) aufweist, das an einer ersten Kurbel (7) angelenkt ist, wobei die erste Kurbel (7) durch einen ersten Motor (8) angetrieben ist, um zu oszillieren, wobei der Hub der Stanze (2) proportional zu einem Oszillationswinkel (α) der ersten Kurbel (7) ist, **dadurch gekennzeichnet, dass** der Oszillationswinkel (α) durch den ersten Motor (8) variiert wird.

2. Stanzkopf (1) nach Anspruch (1), wobei der erste Motor (8) ein bürstenloser Elektromotor ist.

3. Stanzkopf (1) für eine Vorrichtung zum Herstellen von Bürsten oder Besen, mit zumindest einer Stanze (2), die zum Einsetzen von Gruppen von Borsten in einen Bürsten- oder Besenkörper geeignet ist, und Antriebsmitteln (6, 43, 44, 45) der Stanze (2), wobei die Antriebsmittel (6, 43, 44, 45) eine Struktur aufweisen, um einen Hub der Stanze (2) variieren zu können, wobei die Antriebsmittel (6, 43, 44, 45) eine erste Verbindungsstange (6) aufweisen, die ein erstes Ende (6a), das an einen Körper (4) der Stanze (2) angelenkt ist, wobei der Körper (4) in einem Führungskörper (5) gleitend geführt ist, und ein zweites Ende (6b) aufweist, das mit einem ersten Motor (43) verbunden ist, **dadurch gekennzeichnet, dass** der erste Motor (43) ein Linearmotor ist, der ein erstes Gleitstück (44) aufweist, das an einer ersten Gleitführung (45) gleiten kann, wobei das zweite Ende (6b) an dem ersten Gleitstück (44) angelenkt ist, wobei der Hub der Stanze (2) durch Variieren des Hubs des ersten Gleitstücks (44) entlang der ersten Gleitführung (45) variiert wird.

4. Stanzkopf (1) nach irgendeinem der Ansprüche 1 bis 3, weiterhin mit einem Schubelement (9), das in dem Führungskörper (5) und in einem Kopf (3) der Stanze (2) gleitend geführt ist, wobei das Schubelement (9) geeignet ist, die Gruppen von Borsten durch die Stanze (2) zu schieben und die Gruppen von Borsten in einen Bürsten- oder Besenkörper einzusetzen, wobei das Schubelement (9) durch zweite Antriebsmittel (10, 11, 12, 13, 14; 46, 47, 48) angetrieben ist, die eine Struktur aufweisen, die zum Variieren eines Hubs des Schubelements (9) geeignet ist.

5. Stanzkopf (1) nach Anspruch (4), wobei die zweiten Antriebsmittel (10, 11, 12, 13, 14) ein Gleitelement (10) aufweisen, an dem ein Ende des Schubelements (9) festgelegt ist, wobei das Gleitelement (10) entlang vertikaler Führungen (11) gleiten kann, wobei an dem Gleitelement (10) ein erstes Ende (12a) einer zweiten Verbindungsstange (12) angelenkt ist, von der ein zweites Ende (12b) an einer zweiten Kurbel (13) angelenkt ist, die durch einen zweiten Motor (14) in Drehung versetzt wird, wobei der Hub des Schubelements (9) durch Betätigen der Kurbel (13) durch den zweiten Motor (14) mit hin- und hergehender Bewegung mit einem variablen Drehwinkel variiert werden kann.

6. Stanzkopf (1) nach Anspruch 4, wobei die zweiten Antriebsmittel (10, 11, 12, 13, 14) ein Gleitelement (10) aufweisen, an dem ein Ende des Schubelements (9) festgelegt ist, wobei das Gleitelement (10) entlang vertikaler Führungen (11) gleiten kann, wobei an dem Gleitelement (10) ein erstes Ende (12a) einer zweiten Verbindungsstange (12) angelenkt ist, von der ein zweites Ende (12b) an einer zweiten Kurbel (13) angelenkt ist, die durch einen zweiten Motor (14) in Drehung versetzt wird, wobei die Länge des Kurbelarms der zweiten Kurbel (13) einstellbar ist, um den Hub des Schubelements (9) einzustellen.

7. Stanzkopf (1) nach Anspruch 6, wobei die Kurbel (13) mit Lochpaaren (100, 101) versehen ist, in die Fixierelemente (102) einsetzbar sind, mittels der die Kurbel (13) an einem Flansch (103) festgelegt werden kann, der mit der Antriebswelle des zweiten Motors (14) verbunden ist.

8. Stanzkopf (1) nach irgendeinem der Ansprüche 5 bis 7, wobei der zweite Motor (14) ein bürstenloser Elektromotor ist.

9. Stanzkopf (1) nach Anspruch 4, wobei die zweiten Antriebsmittel (10, 11, 12, 46, 47, 48) ein Gleitelement (10) aufweisen, an dem ein Ende des Schubelements (9) festgelegt ist, wobei das Gleitelement (10) entlang vertikaler Führungen (11) gleiten kann, wobei an dem Gleitelement (10) ein erstes Ende (12a) einer zweiten Verbindungsstange (12) angelenkt ist, von der ein zweites Ende (12b) mit einem zweiten Motor (46) verbunden ist, wobei der zweite Motor (46) ein Linearmotor ist, der ein zweites Gleitstück (47) aufweist, das an einer zweiten Gleitführung (46) gleiten kann, wobei das zweites Ende (12b) an dem zweiten Gleitstück (47) angelenkt ist.

10. Stanzkopf (1) nach irgendeinem der Ansprüche 1 bis 9, weiterhin mit einer Schervorrichtung (18), die zum Abscheren eines Draht- oder Bandabschnitts, der dazu vorgesehen ist, ein Fixierelement einer Gruppe von Borsten in dem Bürsten- oder Besenkörper zu bilden, von einem kontinuierlichen Metalldraht (F) oder von einem kontinuierlichen Metallband geeignet ist, der bzw. das von einer Versorgungsrolle kommt, wobei die Schervorrichtung (18) durch dritte Antriebsmittel (15, 16, 17) angetrieben wird, die einen dritten Motor (15) aufweisen, der eine dritte Kurbel (16) antreibt, wobei an einem Ende derselben ein erstes Ende (17a) einer dritten Verbindungsstange (17) angelenkt ist, von der ein zweites Ende (17b) an der Schervorrichtung (18) angelenkt ist.

11. Stanzkopf (1) nach Anspruch 10, wobei der dritte Motor (15) ein bürstenloser Elektromotor ist.

12. Stanzkopf (1) nach irgendeinem der Ansprüche 1 bis 9, weiterhin mit einer Schervorrichtung (18), die zum Abscheren eines Draht- oder Bandabschnitts, der dazu vorgesehen ist, ein Fixierelement einer Gruppe von Borsten in dem Bürsten- oder Besenkörper zu bilden, von einem kontinuierlichen Metalldraht (F) oder von einem kontinuierlichen Metallband geeignet ist, der bzw. das von einer Versorgungsrolle kommt, wobei die Schervorrichtung (18) durch dritte Antriebsmittel (17, 49, 50, 51) angetrieben wird, die eine dritte Verbindungsstange (17) aufweisen, von der ein erstes Ende (17a) mit einem dritten Motor (49) verbunden ist, und von der ein zweites Ende (17b) an der Schervorrichtung (18) angelenkt ist, wobei der dritte Motor (49) ein Linearmotor (49) ist, der ein drittes Gleitstück (50) aufweist, an dem das zweite Ende angelenkt ist, und eine dritte Gleitführung (51), an dem das dritte Gleitstück (50) gleiten kann.

13. Stanzkopf (1) nach irgendeinem der Ansprüche 10 bis 12, weiterhin mit einer Ziehvorrichtung (20), die zum Abwickeln des Metalldrahtes (F) von der Versorgungsrolle und Schieben des Metalldrahtes (F) innerhalb des Führungselements (5) geeignet ist, wobei die Ziehvorrichtung ein aktives Ziehelement (21 a), das durch einen vierten Motor (22) angetrieben ist, und ein Gegenelement (21 b) aufweist, das zum Andrücken des Metalldrahtes (F) an das aktive Ziehelement (21 a) geeignet ist.

14. Stanzkopf (1) nach Anspruch 13, wobei der vierte Motor (22) ein bürstenloser Elektromotor ist.

15. Stanzkopf (1) nach irgendeinem vorhergehenden Anspruch, weiterhin mit einer Vorrichtung (25) zum Einsetzen der Gruppen von Borsten in die Stanze (2), wobei die Einsetzvorrichtung (25) durch einen fünften Motor (23) über eine vierte Kurbel (24) angetrieben ist.

16. Stanzkopf (1) nach Anspruch 15, wobei der fünfte Motor (23) ein bürstenloser Elektromotor ist.

17. Stanzkopf (1) nach irgendeinem vorhergehenden Anspruch, weiterhin mit einer Borsten-Trennvorrichtung (30), die an einem Stützelement (111) festgelegt ist, das an einer Stützplatte (112) und an einem zweiten Ende (29b) einer vierten Verbindungsstange (29) angelenkt ist, deren erstes Ende (29a) an einer fünften Kurbel (28) angelenkt ist, die durch einen sechsten Motor (27) angetrieben ist.

18. Stanzkopf (1) nach Anspruch 17, wobei der sechste Motor (27) ein bürstenloser Elektromotor ist.

19. Stanzkopf (1) nach irgendeinem der Ansprüche 1 bis 16, weiterhin mit einer Borsten-Trennvorrichtung (30), die an einem Stützelement (111) festgelegt ist, das an einer Stützplatte (112) und an einem zweiten Ende (29b) einer vierten Verbindungsstange (29) angelenkt ist, deren erstes Ende (29a) mit einem sechsten Motor (52) verbunden ist, wobei der sechste Motor (52) ein Linearmotor ist, der ein viertes Gleitstück (53) aufweist, an dem das erste Ende (29a) angelenkt ist, und eine vierte Gleitführung (54), an dem das vierte Gleitstück (53) gleiten kann.

20. Stanzkopf (1) nach irgendeinem der Ansprüche 10 bis 19, weiterhin mit einem Formungselement (35), das zum Formen eines Abschnitts des Metalldrahtes

(F) geeignet ist, der durch die Schervorrichtung (18) abgeschert wurde, um das Fixierelement zu erhalten, wobei das Formungselement (35) in den Führungskörper (5) einsetzbar und aus diesem herausziehbar ist, wobei das Formungselement (35) an einem Klemmelement (34) festgelegt ist, das wiederum an einer sechsten Kurbel (32) festgelegt ist, die durch einen siebten Motor (31) angetrieben ist.

21. Stanzkopf (1) nach Anspruch 20, wobei der siebte Motor (31) ein bürstenloser Elektromotor ist.

22. Stanzkopf (1) nach Anspruch 20 oder 21, **dadurch gekennzeichnet, dass** er mit einem Befehls- und Steuersystem (200; 201) in Verbindung steht, das zum Befehlen, Koordinieren und Synchronisieren des Antriebs des ersten Motors (8; 43), des zweiten Motors (14; 46), des dritten Motors (15; 49), des vierten Motors (22), des fünften Motors (23), des sechsten Motors (27; 52) und des siebten Motors (31) geeignet ist.

23. Stanzkopf (1) nach Anspruch 22, wobei das Befehls- und Steuersystem (200; 201) zumindest eine Befehls- und Steuervorrichtung (P; L; Tr; K; A, S, Q) aufweist, die mit zumindest einem der folgenden: dem ersten Motor (8; 43), dem zweiten Motor (14; 46), dem dritten Motor (14; 49), dem vierten Motor (22), dem fünften Motor (23), dem sechsten Motor (27; 52), dem siebten Motor (31), wirkverbunden ist.

24. Stanzkopf (1) nach Anspruch 23, wobei das Befehls- und Steuersystem (200; 201) aufweist: eine erste Befehls- und Steuervorrichtung (P), die mit dem ersten Motor (8; 43) wirkverbunden ist, eine zweite Befehls- und Steuervorrichtung (L), die mit dem zweiten Motor (14; 46) wirkverbunden ist, eine dritte Befehls- und Steuervorrichtung (Tr), die mit dem dritten Motor (15; 49) wirkverbunden ist, eine vierte Befehls- und Steuervorrichtung (K), die mit dem vierten Motor (22) wirkverbunden ist, eine fünfte Befehls- und Steuervorrichtung (A), die mit dem fünften Motor (23) wirkverbunden ist, eine sechste Befehls- und Steuervorrichtung (S), die mit dem sechsten Motor (27; 52) wirkverbunden ist, und eine siebte Befehls- und Steuervorrichtung (Q), die mit dem siebten Motor (31) wirkverbunden ist.

25. Stanzkopf (1) nach Anspruch 24, wobei die Befehls- und Steuervorrichtungen (P; L; Tr; K; A; S; Q) miteinander wirkverbunden sind.

26. Stanzkopf (1) nach Anspruch 24, wobei jede der Befehls- und Steuervorrichtungen (P; L; Tr; K; A; S; Q) mit einer zentralen Befehls- und Steuervorrichtung (M) wirkverbunden ist.

27. Vorrichtung zum Herstellen von Bürsten oder Besen, **dadurch gekennzeichnet, dass** sie einen oder mehrere Stanzköpfe gemäß irgendeinem der Ansprüche 1 bis 26 aufweist.

Revendications

1. Tête de poinçonnage (1) pour un appareil destiné à fabriquer des brosses ou des balais, comprenant au moins un dispositif de poinçonnage (2), apte à insérer des groupes de poils dans un corps de brosse ou de balai, et des moyens d'entraînement (6, 7, 8) dudit dispositif de poinçonnage (2), lesdits moyens d'entraînement (6, 7, 8) étant structurés de manière à pouvoir faire varier une course dudit dispositif de poinçonnage (2), lesdits moyens d'entraînement (6, 7, 8) comprenant une première tige de liaison (6) comportant une première extrémité (6a) articulée sur un corps (4) du dispositif de poinçonnage (2), ledit corps (4) étant guidé de manière à coulisser dans un corps de guidage (5), et une deuxième extrémité (6b) articulée sur une première manivelle (7), ladite première manivelle (7) étant entraînée par un premier moteur (8) de manière à osciller, ladite course du dispositif de poinçonnage (2) étant proportionnelle à un angle d'oscillation (α) de ladite première manivelle (7), **caractérisée en ce que** ledit angle d'oscillation (α) est modifié par ledit premier moteur (8).

2. Tête de poinçonnage (1) selon la revendication 1, dans laquelle ledit premier moteur (8) est un moteur électrique sans balais.

3. Tête de poinçonnage (1) pour un appareil destiné à fabriquer des brosses ou des balais, comprenant au moins un dispositif de poinçonnage (2), apte à insérer des groupes de poils dans un corps de brosse ou de balai, et des moyens d'entraînement (6, 43, 44, 45) dudit dispositif de poinçonnage (2), lesdits moyens d'entraînement (6, 43, 44, 45) étant structurés de manière à pouvoir faire varier une course dudit dispositif de poinçonnage (2), lesdits moyens d'entraînement (6,43,44,45) comprenant une première tige de liaison (6) comportant une première extrémité (6a) articulée sur un corps (4) du dispositif de poinçonnage (2), ledit corps (4) étant guidé de manière à coulisser dans un corps de guidage (5), et une deuxième extrémité (6b) reliée à un premier moteur (43), **caractérisée en ce que** ledit premier moteur (43) est un moteur linéaire comprenant un premier coulisseau (44) qui peut coulisser sur un premier guide de coulissement (45), ladite deuxième extrémité (6b) étant articulée sur ledit premier coulisseau (44), et **en ce que** la course dudit dispositif de poinçonnage (2) est modifiée en faisant varier la course dudit premier coulisseau (44) le long dudit premier guide de coulissement (45).

4. Tête de poinçonnage (1) selon l'une quelconque des revendications 1 à 3, comprenant en outre un élément de poussée (9) guidé de manière à coulisser dans ledit corps de guidage (5) et dans une tête (3) dudit dispositif de poinçonnage (2), ledit élément de poussée (9) étant apte à pousser lesdits groupes de poils à travers ledit dispositif de poinçonnage (2) et à insérer les groupes de poils dans un corps de brosse ou de balai, ledit élément de poussée (9) étant entraîné par des deuxièmes moyens d'entraînement (10, 11, 12, 13, 14 ; 46, 47, 48) structurés de manière à être aptes à faire varier une course dudit élément de poussée (9).

5. Tête de poinçonnage (1) selon la revendication 4, dans laquelle lesdits deuxièmes moyens d'entraînement (10, 11, 12, 13, 14) comprennent un élément de coulissement (10), auquel est fixée une extrémité de l'élément de poussée (9), ledit élément de coulissement (10) pouvant coulisser le long de guides verticaux (11), une première extrémité (12a) d'une deuxième tige de liaison (12) étant articulée sur l'élément de coulissement (10), une deuxième extrémité (12b) de cette dernière étant articulée sur une deuxième manivelle (13) qu'un deuxième moteur (14) entraîne en rotation, la course dudit élément de poussée (9) pouvant être modifiée par mise en fonctionnement de ladite manivelle (13), au moyen dudit deuxième moteur (14), avec un mouvement de va-et-vient selon un angle de rotation variable.

6. Tête de poinçonnage (1) selon la revendication 4, dans laquelle lesdits deuxièmes moyens d'entraînement (10, 11, 12, 13, 14) comprennent un élément de coulissement (10), auquel est fixée une extrémité de l'élément de poussée (9), ledit élément de coulissement (10) pouvant coulisser le long de guides verticaux (11), une première extrémité (12a) d'une deuxième tige de liaison (12) étant articulée sur l'élément de coulissement (10), une deuxième extrémité (12b) de cette dernière étant articulée sur une deuxième manivelle (13) qu'un deuxième moteur (14) entraîne en rotation, la longueur du bras de manivelle de ladite deuxième manivelle (13) pouvant être ajustée pour ajuster la course dudit élément de poussée (9).

7. Tête de poinçonnage (1) selon la revendication 6, dans laquelle ladite manivelle (13) est pourvue de paires d'orifices (100, 101) dans lesquels peuvent être insérés des éléments de fixation (102) au moyen desquels la manivelle (13) peut être fixée sur une collerette (103) reliée à l'arbre d'entraînement du deuxième moteur (14).

8. Tête de poinçonnage (1) selon l'une quelconque des revendications 5 à 7, dans laquelle ledit deuxième moteur (14) est un moteur électrique sans balais.

9. Tête de poinçonnage (1) selon la revendication 4, dans laquelle lesdits deuxièmes moyens d'entraînement (10, 11, 12, 46, 47, 48) comprennent un élément de coulissement (10), auquel est fixée une extrémité de l'élément de poussée (9), ledit élément de coulissement (10) pouvant coulisser le long de guides verticaux (11), une première extrémité (12a) d'une deuxième tige de liaison (12) étant articulée sur l'élément de coulissement (10), une deuxième extrémité (12b) de cette dernière étant reliée à un deuxième moteur (46), ledit deuxième moteur (46) étant un moteur linéaire comprenant un deuxième coulisseau (47) qui peut coulisser sur un deuxième guide de coulissement (46), ladite deuxième extrémité (12b) étant articulée sur ledit deuxième coulisseau (47).

10. Tête de poinçonnage (1) selon l'une quelconque des revendications 1 à 9, comprenant en outre un dispositif de cisaillement (18) apte à opérer, à partir d'un fil métallique continu (F), ou d'une bande métallique continue, provenant d'un rouleau d'alimentation, le cisaillement d'une portion de fil ou de bande destinée à constituer un élément de fixation d'un groupe de poils dans ledit corps de brosse ou de balai, ledit dispositif de cisaillement (18) étant entraîné par des troisièmes moyens d'entraînement (15, 16, 17) qui comprennent un troisième moteur (15), ce dernier entraînant une troisième manivelle (16) sur une extrémité duquel est articulée une première extrémité (17a) d'une troisième tige de liaison (17), une deuxième extrémité (17b) de cette dernière étant articulée sur le dispositif de cisaillement (18).

11. Tête de poinçonnage (1) selon la revendication 10, dans laquelle ledit troisième moteur (15) est un moteur électrique sans balais.

12. Tête de poinçonnage (1) selon l'une quelconque des revendications 1 à 9, comprenant en outre un dispositif de cisaillement (18) apte à opérer, à partir d'un fil métallique continu (F), ou d'une bande métallique continue, provenant d'un rouleau d'alimentation, le cisaillement d'une portion de fil ou de bande destinée à constituer un élément de fixation d'un groupe de poils dans ledit corps de brosse ou de balai, ledit dispositif de cisaillement (18) étant entraîné par des troisièmes moyens d'entraînement (17, 49, 50, 51) qui comprennent une troisième tige de liaison (17) dont une première extrémité (17a) est reliée à un troisième moteur (49) et dont une deuxième extrémité (17b) est articulée sur le dispositif de cisaillement (18), ledit troisième moteur (49) étant un moteur linéaire (49) comprenant un troisième coulisseau (50), sur lequel ladite deuxième extrémité est articulée, et un troisième guide de coulissement (51), sur lequel ledit troisième coulisseau (50) peut coulisser.

13. Tête de poinçonnage (1) selon l'une quelconque des revendications 10 à 12, comprenant en outre un dispositif de traction (20) qui est apte à dérouler ledit fil métallique (F) à partir dudit rouleau d'alimentation et à pousser le fil métallique (F) à l'intérieur dudit élément de guidage (5), ledit dispositif de traction comprenant un élément actif de traction (21a) entraîné par un quatrième moteur (22) et un élément opposé (21b) qui est apte à appuyer ledit fil métallique (F) sur ledit élément actif de traction (21a).

14. Tête de poinçonnage (1) selon la revendication 13, dans laquelle ledit quatrième moteur (22) est un moteur électrique sans balais.

15. Tête de poinçonnage (1) selon une quelconque revendication précédente, comprenant en outre un dispositif (25) pour l'insertion desdits groupes de poils dans ledit dispositif de poinçonnage (2), ledit dispositif d'insertion (25) étant entraîné par un cinquième moteur (23) par l'intermédiaire d'une quatrième manivelle (24).

16. Tête de poinçonnage (1) selon la revendication 15, dans laquelle ledit cinquième moteur (23) est un moteur électrique sans balais.

17. Tête de poinçonnage (1) selon une quelconque revendication précédente, comprenant en outre un dispositif de séparation de poils (30) fixé à un élément de support (111) articulé sur une plaque de support (112) et sur une deuxième extrémité (29b) d'une quatrième tige de liaison (29) dont la première extrémité (29a) est articulée sur une cinquième manivelle (28) entraînée par un sixième moteur (27).

18. Tête de poinçonnage (1) selon la revendication 17, dans laquelle ledit sixième moteur (27) est un moteur électrique sans balais.

19. Tête de poinçonnage (1) selon l'une quelconque des revendications 1 à 16, comprenant en outre un dispositif de séparation de poils (30) fixé à un élément de support (111) articulé sur une plaque de support (112) et sur une deuxième extrémité (29b) d'une quatrième tige de liaison (29) dont la première extrémité (29a) est reliée à un sixième moteur (52), ledit sixième moteur (52) étant un moteur linéaire comprenant un quatrième coulisseau (53), sur lequel ladite première extrémité (29a) est articulée, et un quatrième guide de coulissement (54), sur lequel ledit quatrième coulisseau (53) peut coulisser.

20. Tête de poinçonnage (1) selon l'une quelconque des revendications 10 à 19, comprenant en outre un élément de mise en forme (35) qui est apte à la mise en forme d'une portion dudit fil métallique (F) cisaillé par ledit dispositif de cisaillement (18) pour obtenir ledit élément de fixation, ledit élément de mise en forme (35) pouvant être inséré dans ledit corps de guidage (5) et extrait de ce dernier, ledit élément de mise en forme (35) étant fixé à un élément de serrage (34), lui-même fixé à une sixième manivelle (32) entraînée par un septième moteur (31).

21. Tête de poinçonnage (1) selon la revendication 20, dans laquelle ledit septième moteur (31) est un moteur électrique sans balais.

22. Tête de poinçonnage (1) selon la revendication 20 ou 21, **caractérisée en ce qu'**elle est associée à un système de commande et de contrôle (200 ; 201) apte à commander, coordonner et synchroniser les entraînements dudit premier moteur (8 ; 43), dudit deuxième moteur (14 ; 46), dudit troisième moteur (15 ; 49), dudit quatrième moteur (22), dudit cinquième moteur (23), dudit sixième moteur (27 ; 52) et dudit septième moteur (31).

23. Tête de poinçonnage (1) selon la revendication 22, dans laquelle ledit système de commande et de contrôle (200 ; 201) comprend au moins un dispositif de commande et de contrôle (P ; L ; Tr ; K ; A ; S ; Q) connecté de manière fonctionnelle à au moins l'un desdits premier moteur (8 ; 43), deuxième moteur (14 ; 46), troisième moteur (15 ; 49), quatrième moteur (22), cinquième moteur (23), sixième moteur (27 ; 52) et septième moteur (31).

24. Tête de poinçonnage (1) selon la revendication 23, dans laquelle ledit système de commande et de contrôle (200 ; 201) comprend un premier dispositif de commande et de contrôle (P) connecté de manière fonctionnelle audit premier moteur (8 ; 43), un deuxième dispositif de commande et de contrôle (L) connecté de manière fonctionnelle audit deuxième moteur (14 ; 46), un troisième dispositif de commande et de contrôle (Tr) connecté de manière fonctionnelle audit troisième moteur (15 ; 49), un quatrième dispositif de commande et de contrôle (K) connecté de manière fonctionnelle audit quatrième moteur (22), un cinquième dispositif de commande et de contrôle (A) connecté de manière fonctionnelle audit cinquième moteur (23), un sixième dispositif de commande et de contrôle (S) connecté de manière fonctionnelle audit sixième moteur (27 ; 52) et un septième dispositif de commande et de contrôle (Q) connecté de manière fonctionnelle audit septième moteur (31).

25. Tête de poinçonnage (1) selon la revendication 24, dans laquelle lesdits dispositifs de commande et de contrôle (P ; L ; Tr ; K ; A ; S ; Q) sont connectés de manière fonctionnelle entre eux.

26. Tête de poinçonnage (1) selon la revendication 24,

dans laquelle chacun desdits dispositifs de commande et de contrôle (P ; L ; Tr ; K ; A ; S ; Q) est connecté de manière fonctionnelle à un dispositif central de commande et de contrôle (M).

27. Appareil destiné à fabriquer des brosses ou des balais, **caractérisé en ce qu'**il comprend une ou plusieurs têtes de poinçonnage selon l'une quelconque des revendications 1 à 26.

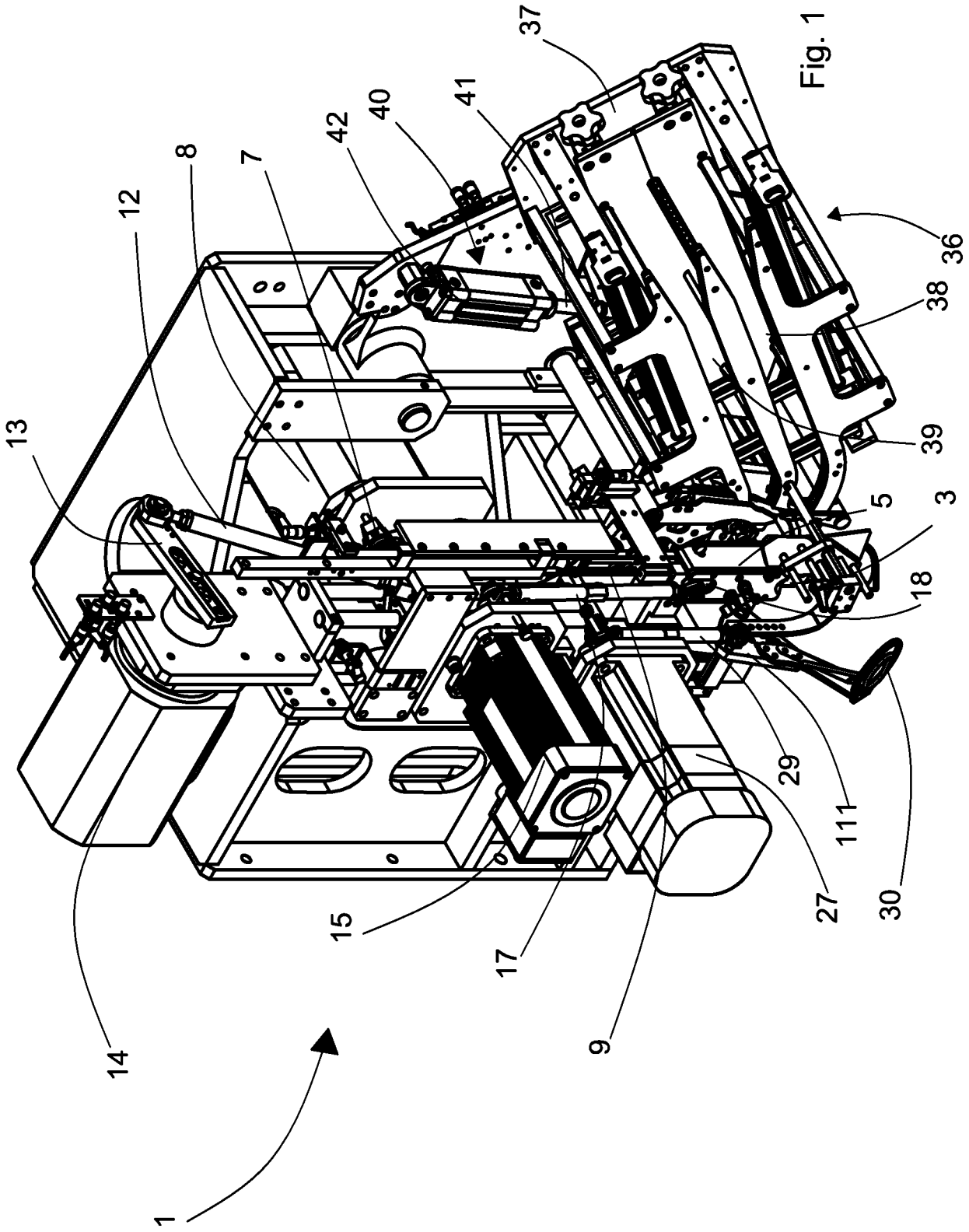


Fig. 1

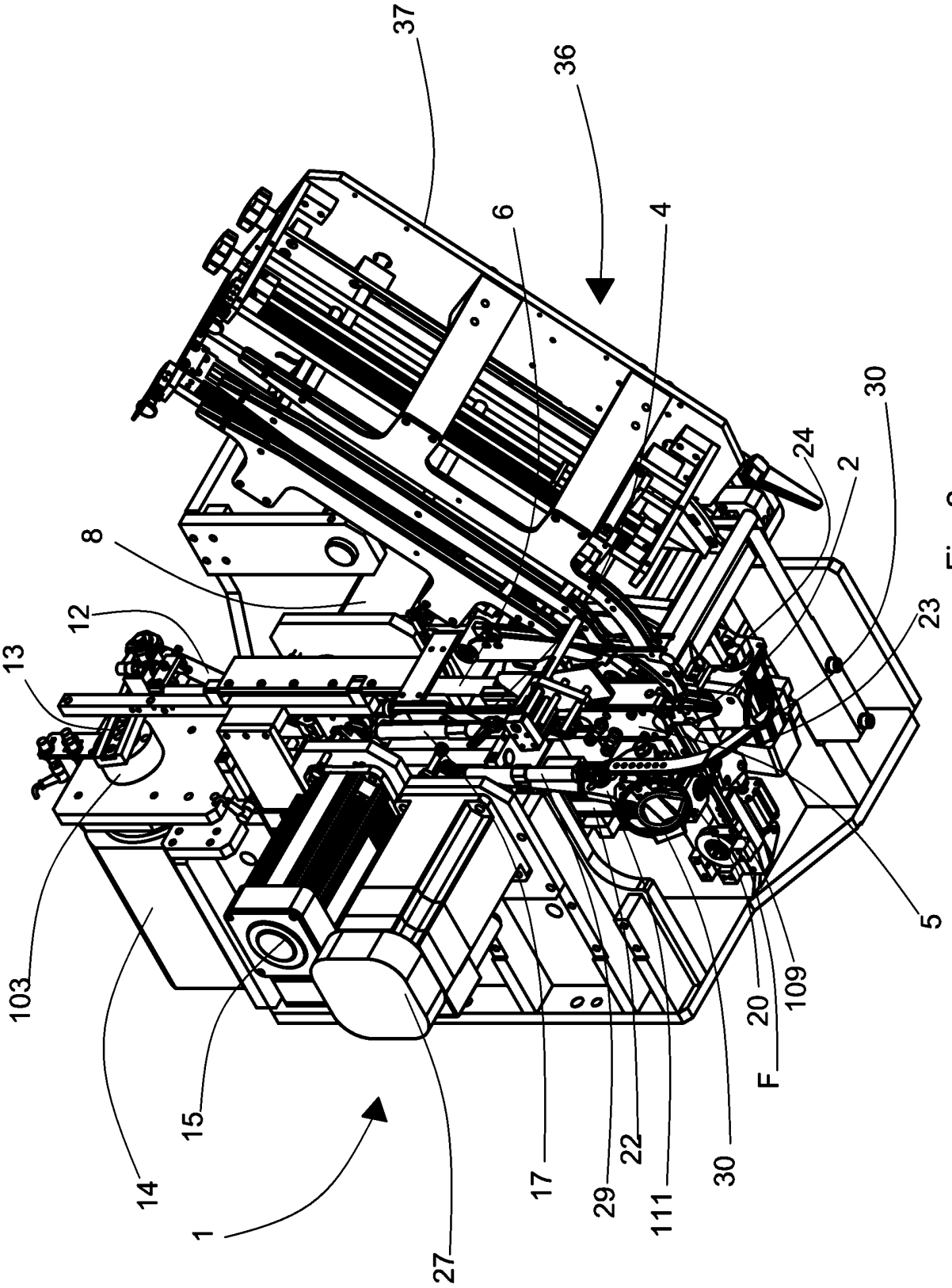


Fig. 2

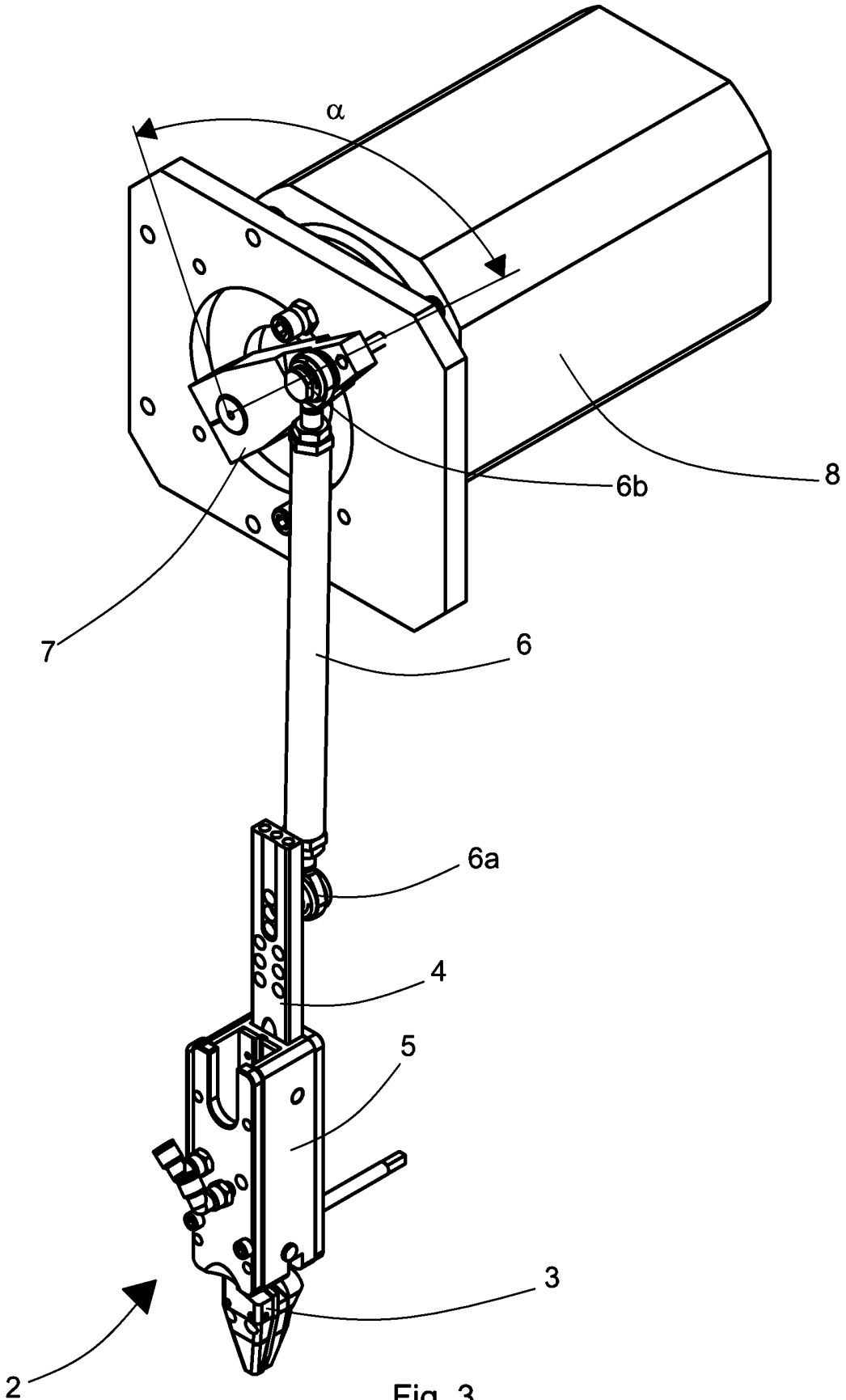


Fig. 3

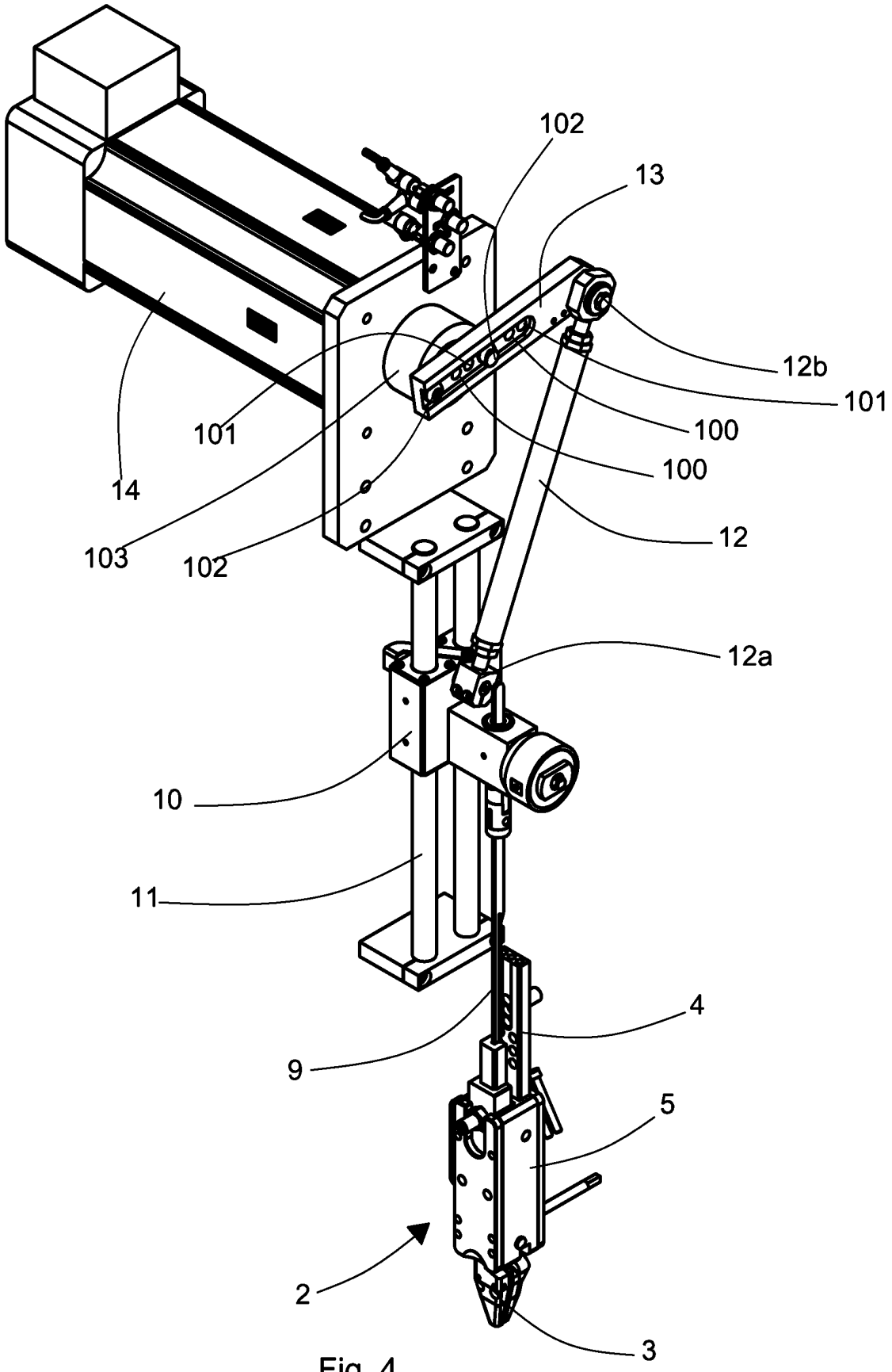


Fig. 4

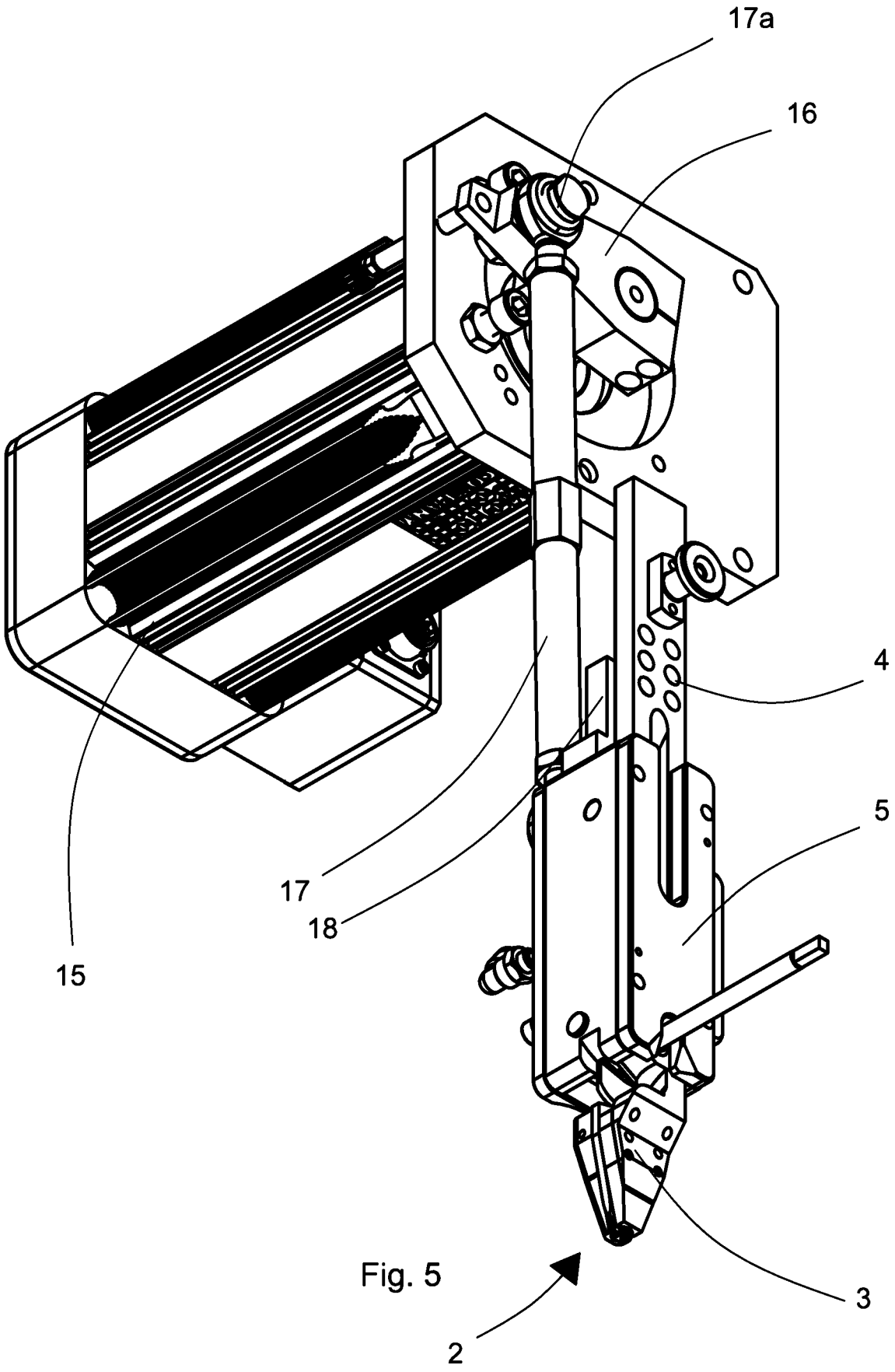


Fig. 5

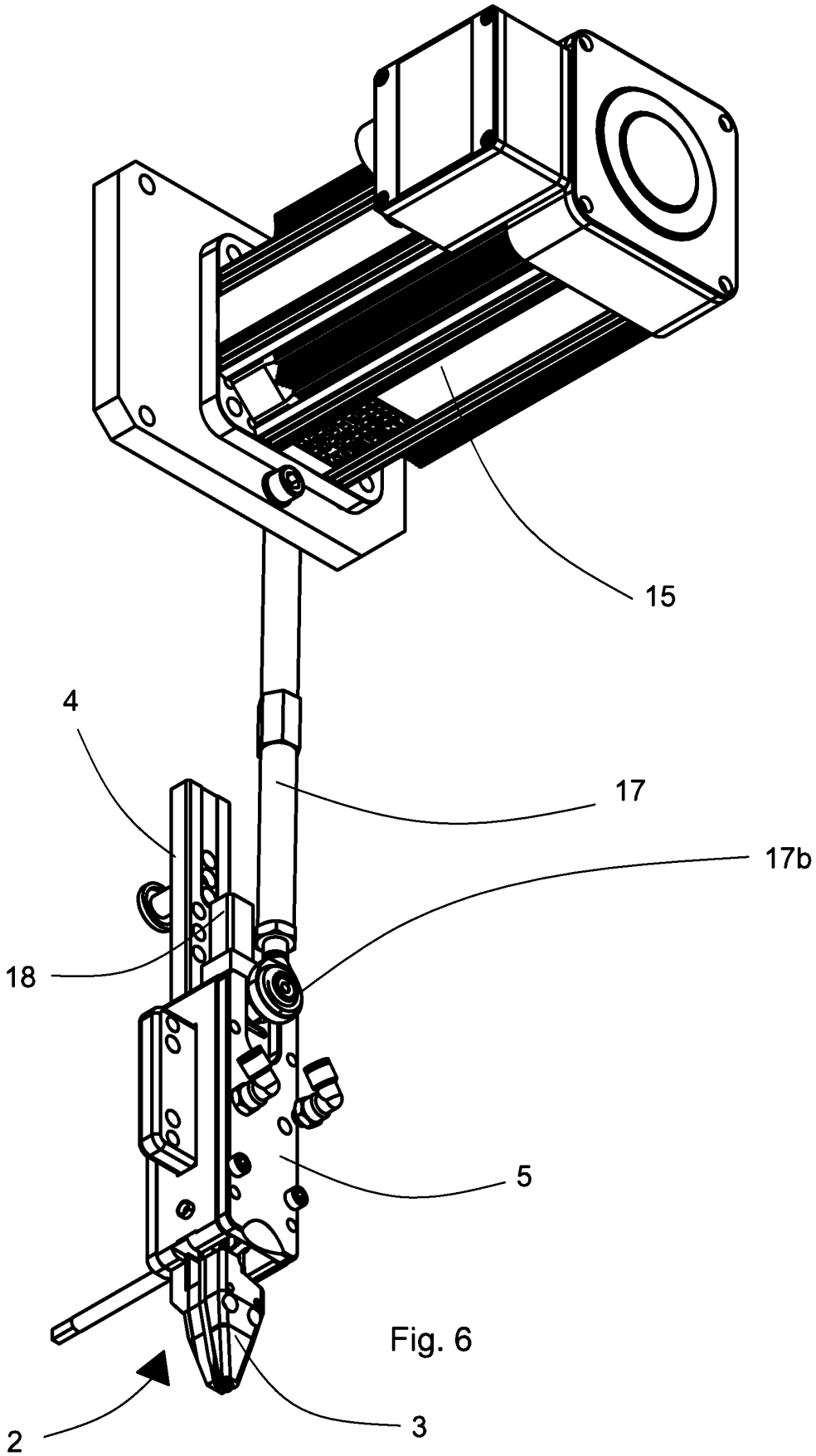


Fig. 6

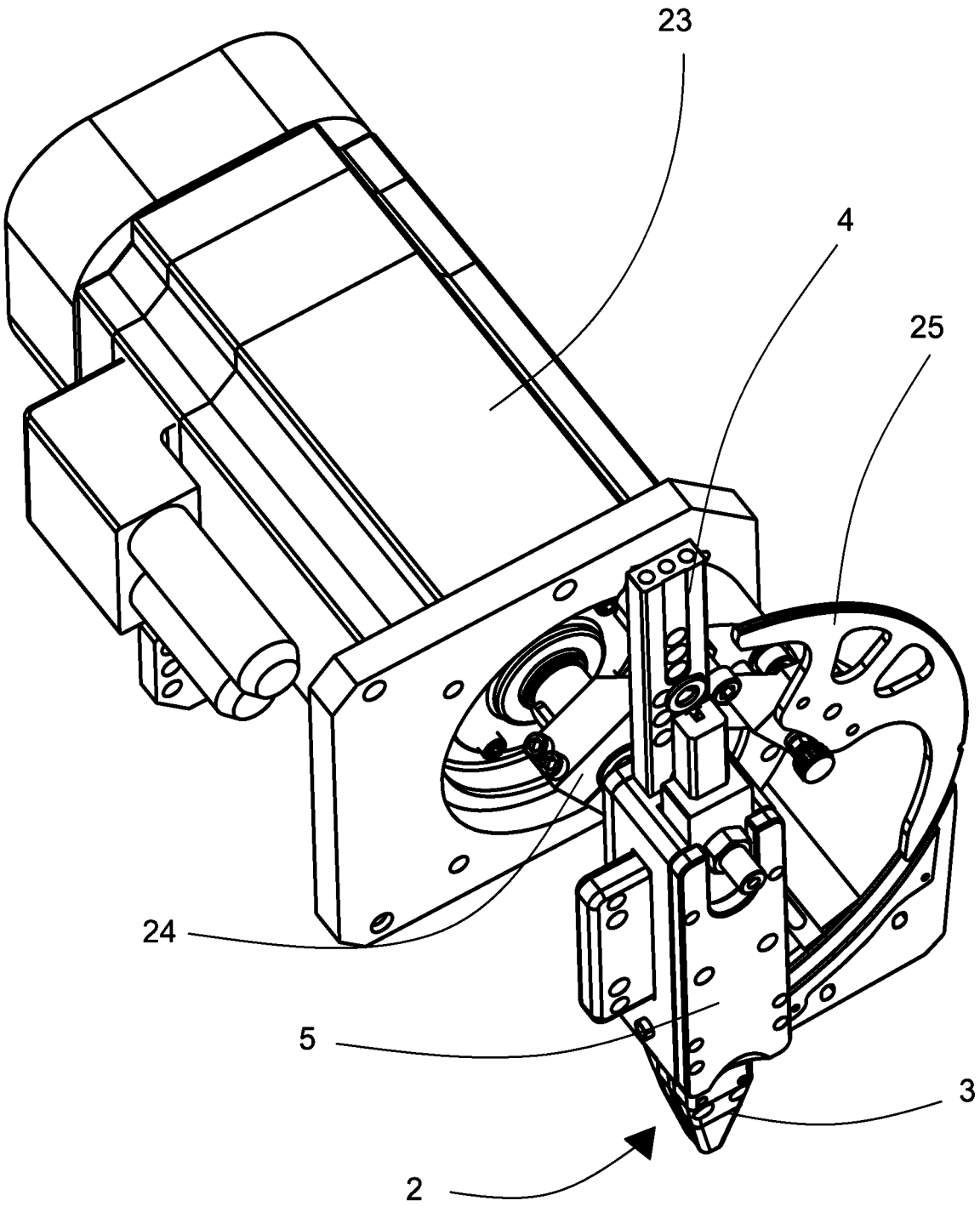


Fig. 7

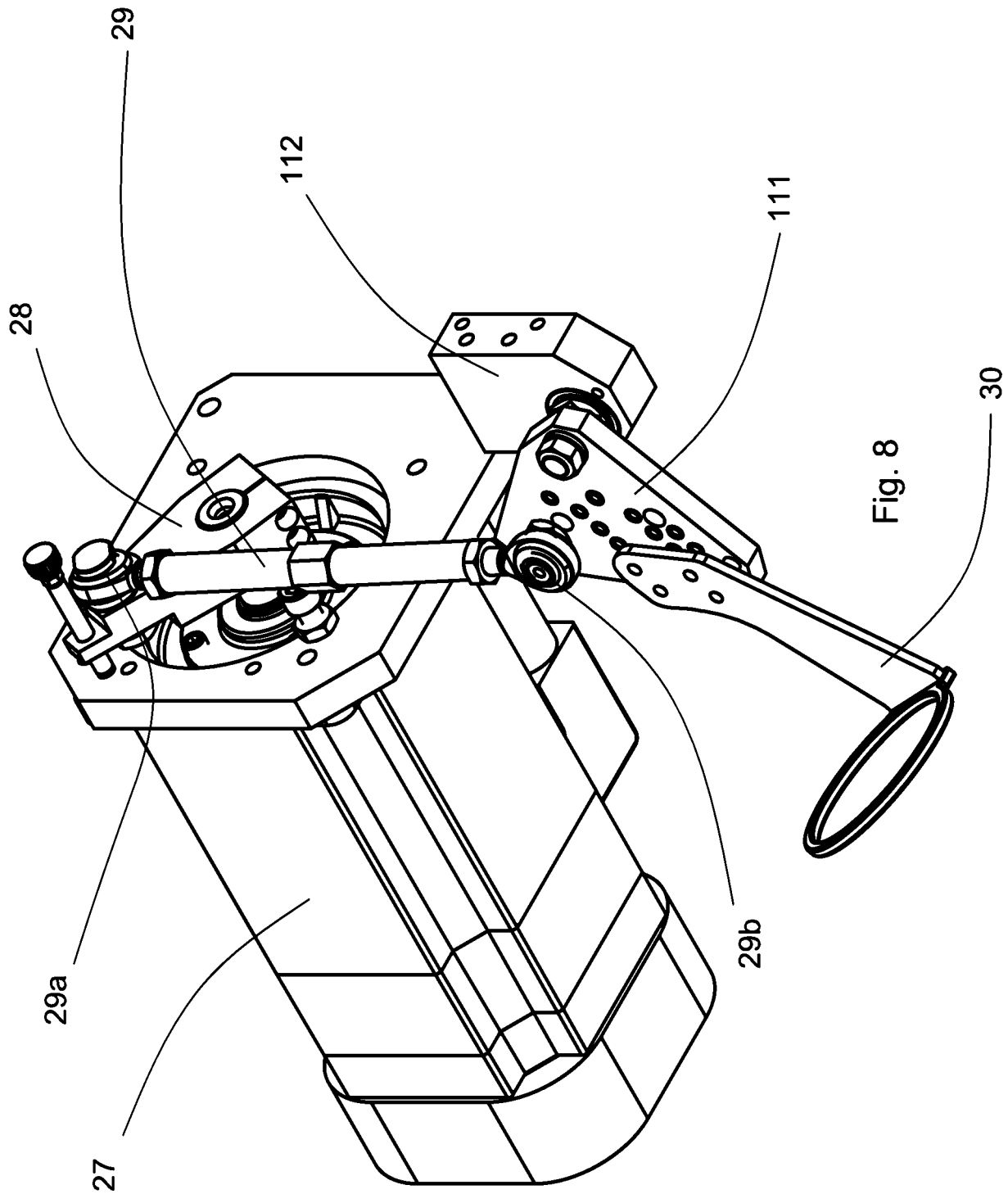


Fig. 8

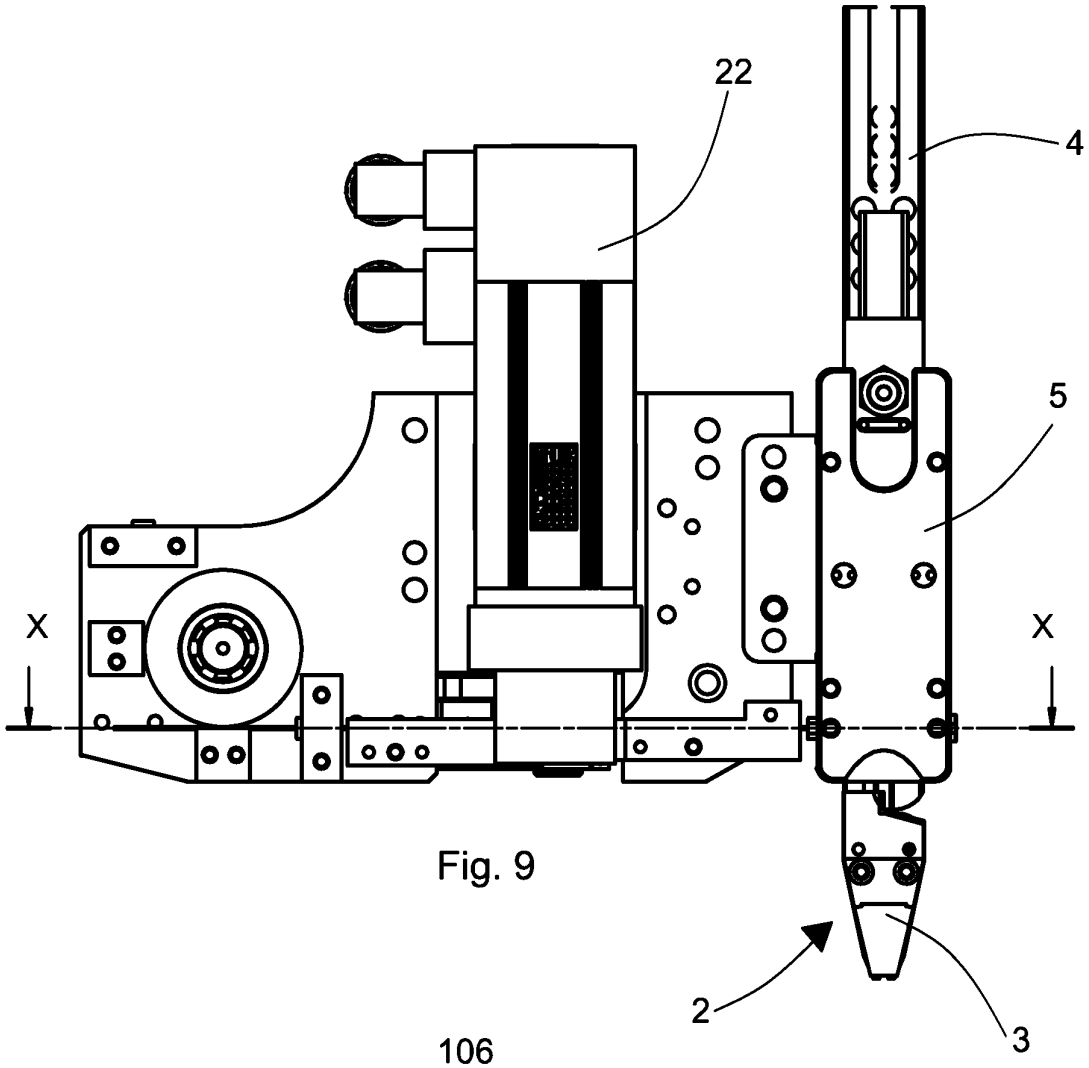


Fig. 9

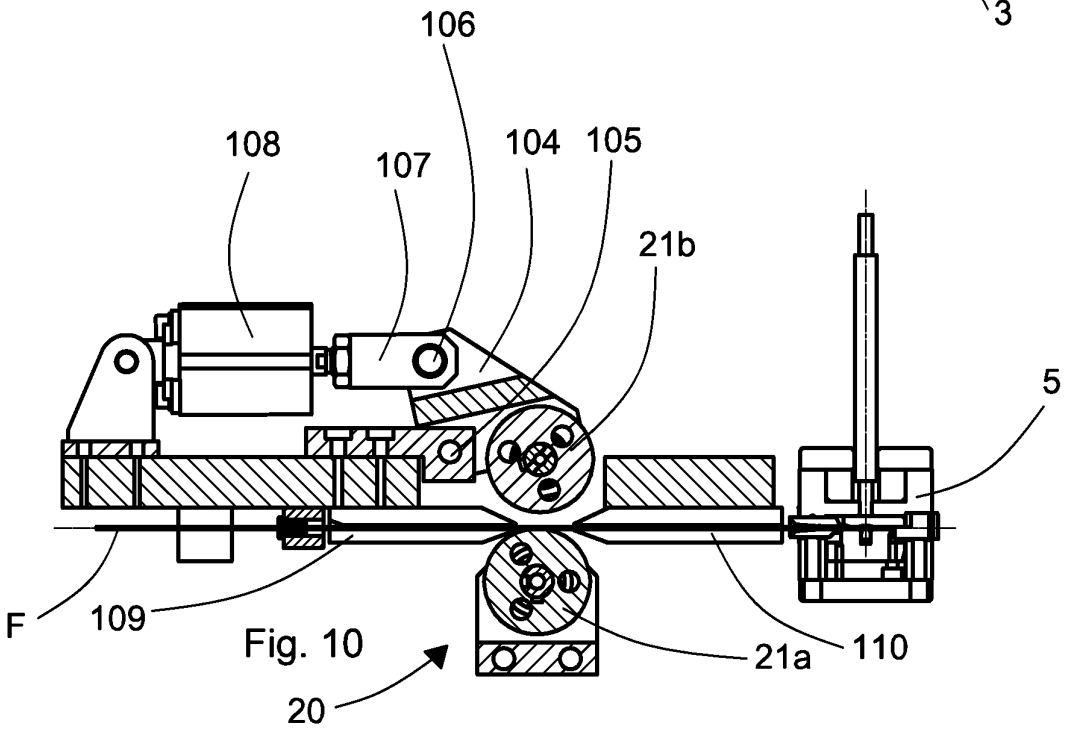


Fig. 10

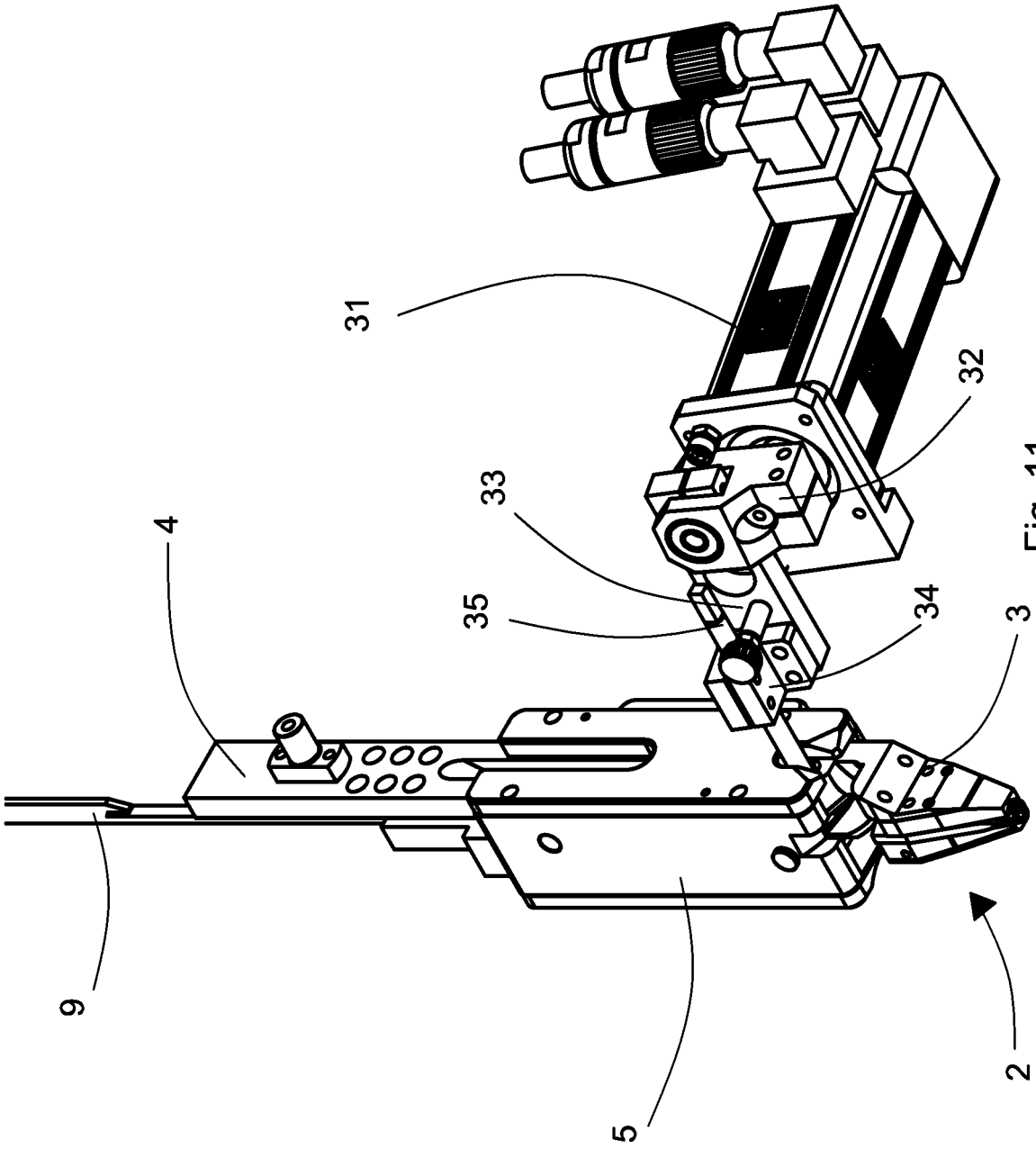


Fig. 11

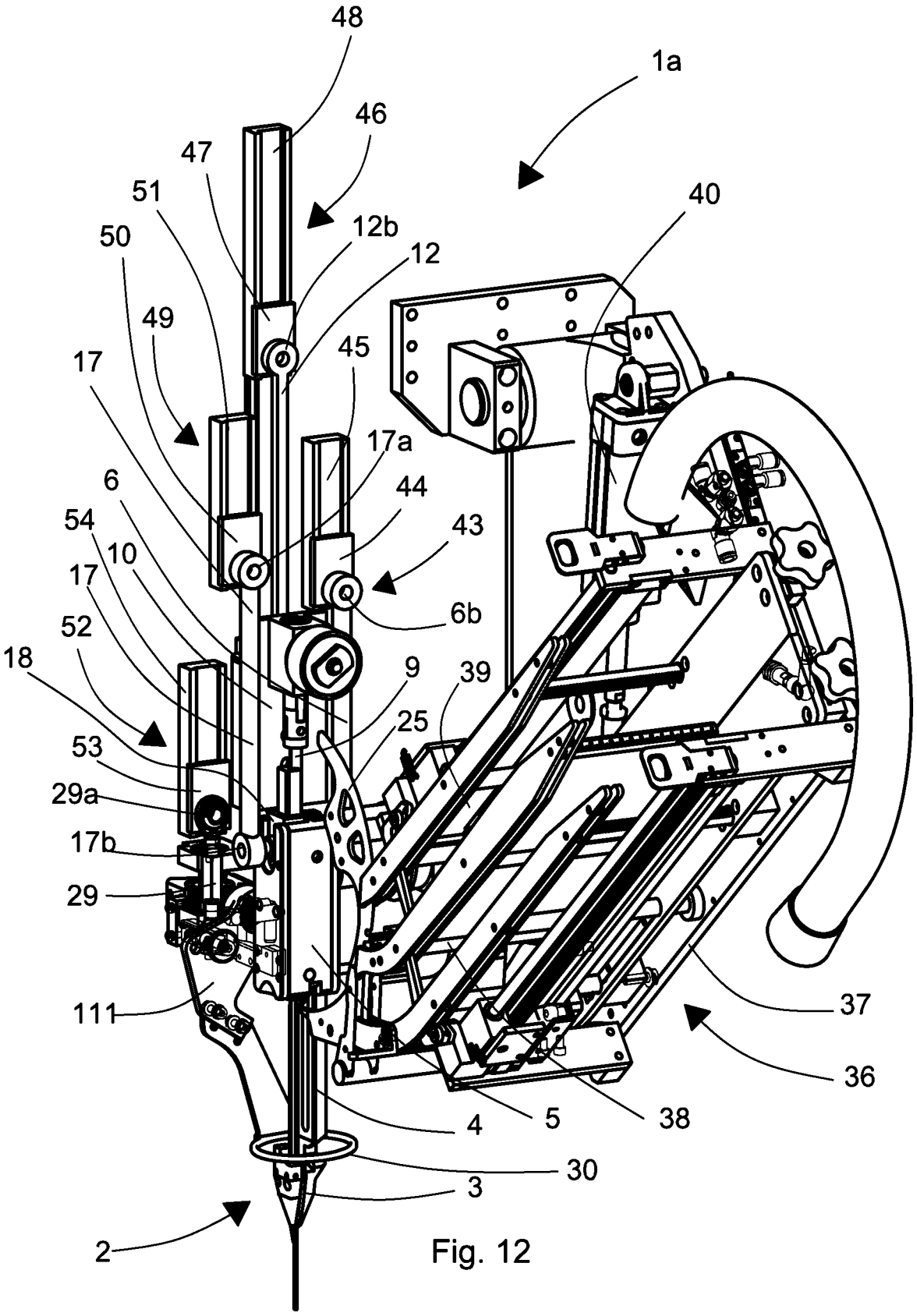

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Fig. 12

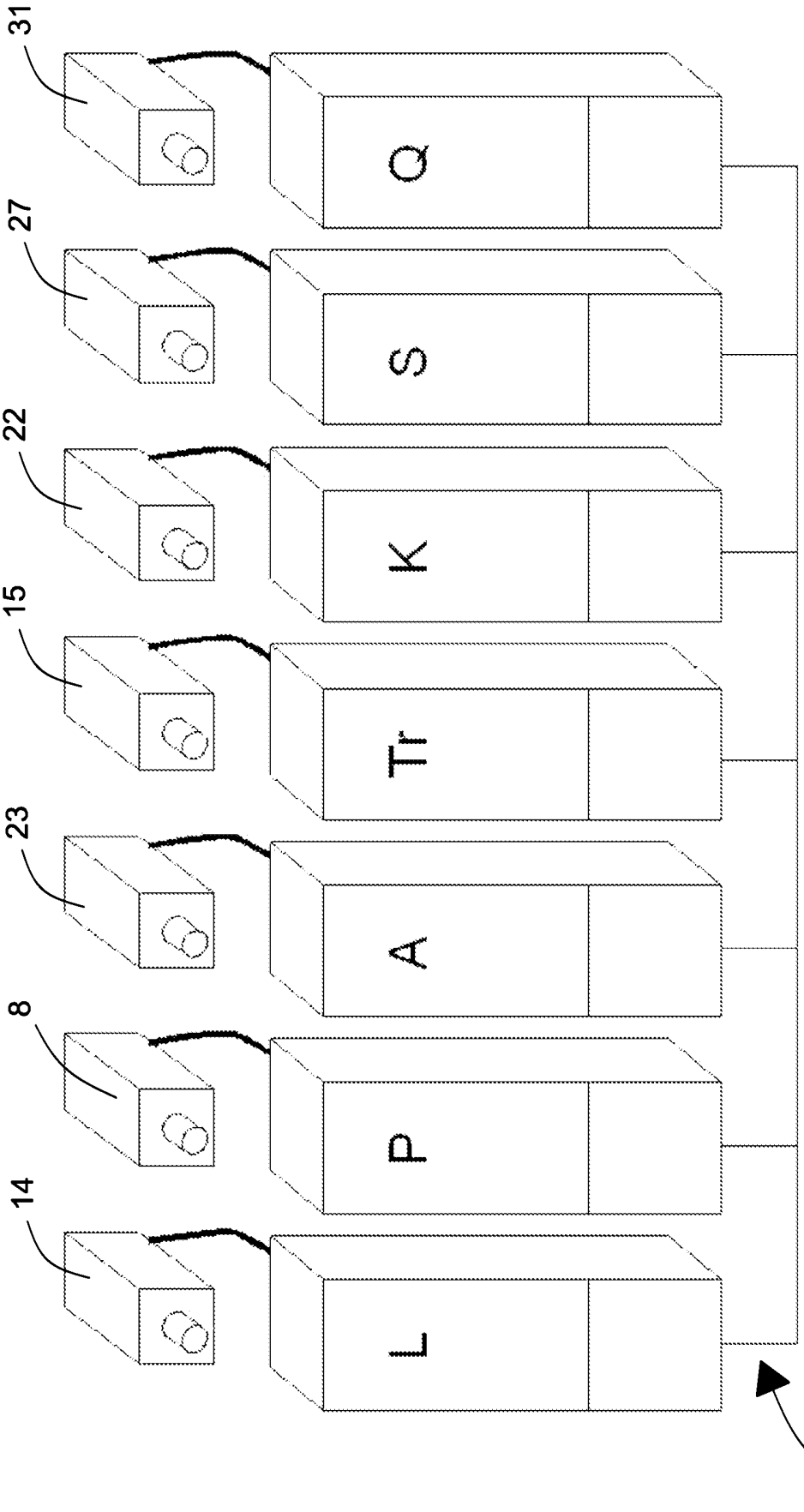


Fig. 13

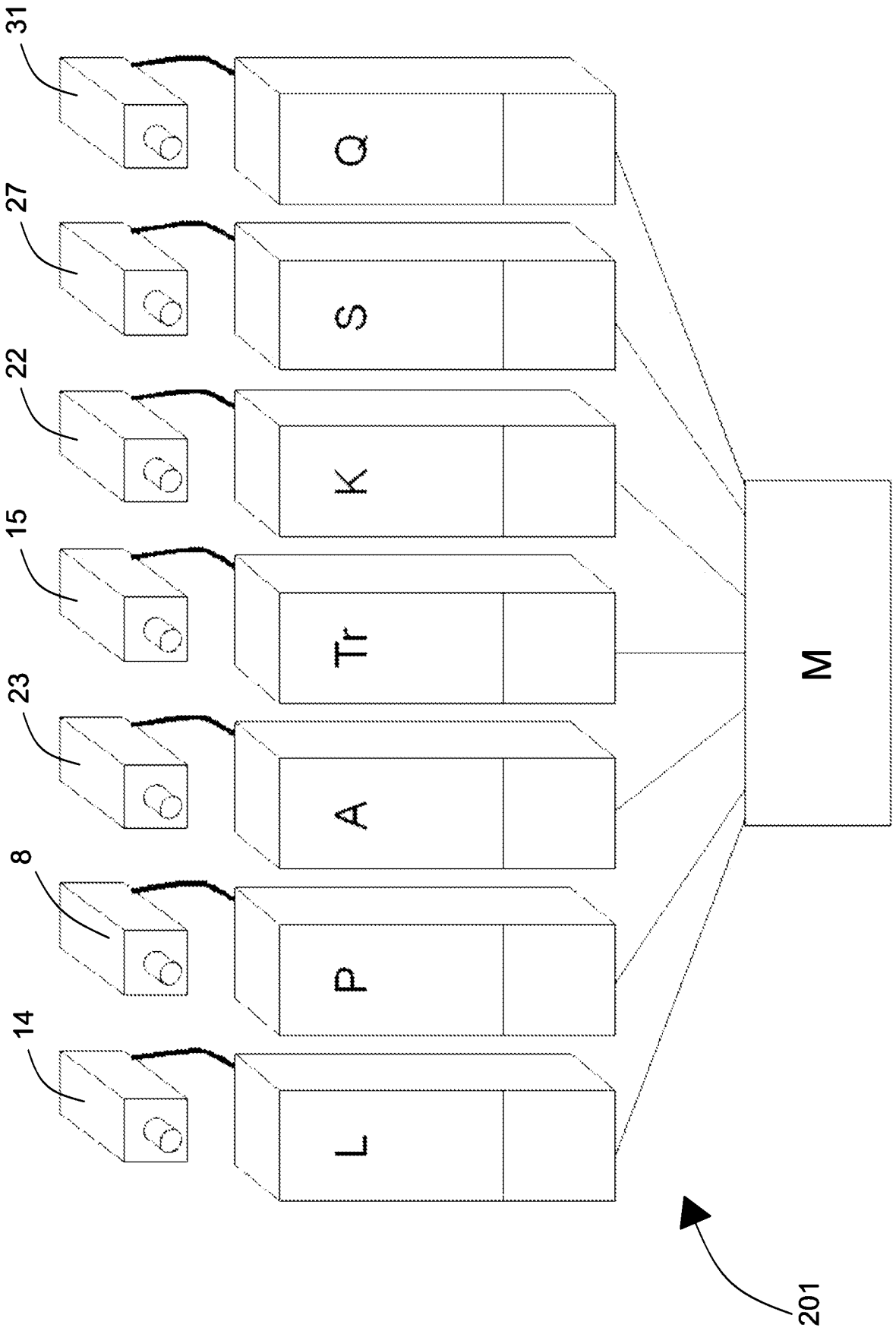


Fig. 14

REFERENCES CITED IN THE DESCRIPTION

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