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(54) **BLIND SLATS THREADING DEVICE**

(57) A blind slat threading device (1) comprising two supporting stands (17) which are arranged opposite each other, each supporting stand (17) bearing one assembly (28) consisting of a front jaw (6) and a rear jaw (6'), whereas the front jaws (6) are provided with an upper half-tooth (7) at the top and a lower half-tooth (9) at the bottom and two middle teeth (8) arranged between them, wherein on the front jaws (6) carriers (25) of guiding grooves (10) with a needle (26) for guiding the slat are arranged, wherein the front abutting portion (34) of the carrier (25) is an integral part of the front jaws (6) and on the rear linearly movable working portion (33) the guiding grooves (10) are arranged, wherein the size of the guiding grooves (10) corresponds to the size of the gap (38) between the middle teeth (8), the rear jaws (6') are provided with an upper half-tooth (11) at the top and a lower half-tooth (12) at the bottom, whereas between the upper half-tooth (7) and the upper middle tooth (8) and the lower half-tooth (9) and the lower middle tooth (8) of the front jaws (6) gaps (27) are arranged, against which dimensionally corresponding upper half-tooth (11) and lower half-tooth (12) on the rear jaws (6') are arranged, whereas the jaws (6, 6') are pivotally connected to the upper cover plate (36) of the supporting stand (17), wherein holes (20) are created in the mounting plate (18), whereas in the holes (20) two positioning gears (15) are rotatably arranged, which engage with gear segments (14) which are fixed via a support plate (13) to the lower part of the rear jaw (6').

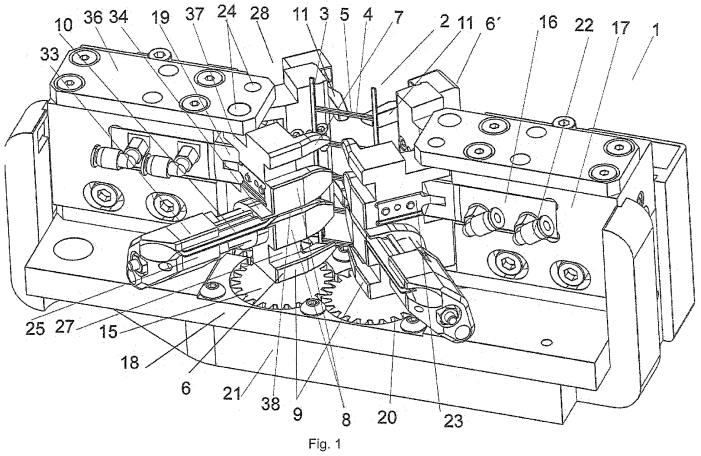

Fig. 1

EP 3 919 716 A2

Description

Technical field

[0001] The invention relates to a device for threading blind slats into support ladders.

State of the art

[0002] Nowadays, there are several types of blinds, designed for both exterior and interior use, both horizontal and vertical, etc. Horizontal blinds are diferentiated according to how the individual slats are joined together to be arranged in the desired positions and spacing, while being easy to operate in terms of tilting, pulling down and pulling up.

[0003] In large, mostly outdoor blinds, so-called ladders are used to carry the slats, which consist of two extreme vertical cords connected at certain intervals by a pair of transverse strings, closely arranged together forming a slit. A slat is threaded into this slit and then carried by the ladder.

[0004] The blinds have a ladder with fabric strings. The ladder is used to tilt the blinds and the strips to pull the blinds up. Generally, for interior blinds, the slat is threaded into the space between two pairs of strings, i.e. into the large window of the ladder. The problem is that in such a large space the slat can easily twist or turn. This is most problematic at inter-glass blinds, as this problem cannot be easily corrected, and also at sloping roof windows where this situation occurs quite often. Therefore, in these applications the slats are still threaded between the strings by hand. There is not a device on the market that automates the threading process with sufficient reliability, where the device synchronises all the necessary movements and actions performed with the slat and ladder to ensure safe threading so that the ladder is not cut. Thus, in automation, it is necessary to solve the problem of the slat cutting the thin string of the ladder during threading because the slats have sharp edges.

[0005] The aim of the invention is to introduce a device for automatically threading thin slats of blinds into ladders, which would be able to thread the slats safely without cutting the ladder and turning the slats.

Summary of the invention

[0006] The above mentioned deficiencies are eliminated by blind slats threading device according to the invention, which is characterised by the fact that each supporting stand is provided with two pneumatic actuator modules, each stand bearing one assembly consisting of a front jaw and a rear jaw, whereas the front jaws are provided with an upper half-tooth at the top and a lower half-tooth at the bottom and two middle teeth arranged between them, wherein on the front jaws carriers of guiding grooves with a needle for guiding the slat are arranged, wherein the front abutting portion of the carrier is an integral part of the front jaws and on the rear linearly movable working portion the guiding grooves are arranged, wherein the size of the guiding grooves corresponds to the size of the gap between the middle teeth, the rear jaws are provided with an upper half-tooth at the top and a lower half-tooth at the bottom, whereas between the upper half-tooth and the upper middle tooth and the lower half-tooth and the lower middle tooth of the front jaws gaps are arranged, against which dimensionally corresponding upper half-tooth and lower half-tooth on the rear jaws are arranged, whereas the jaws are pivotally connected to the upper cover plate of the supporting stand via an arm and a pin arranged thereon, and at the same time via a holder which is part of the pneumatic actuator module with a supporting fork, wherein holes are created in the mounting plate, whereas in the holes two positioning gears are rotatably arranged, which engage with gear segments which are fixed via a support plate to the lower part of the rear jaw.

[0007] In a preferred embodiment, arc-shaped grooves are created in the gear segments for the passage of tubing to the pneumatic actuator modules.

[0008] In another preferred embodiment the support plate is attached to a supporting pin also arranged at the bottom of the rear jaw.

Brief description of drawings

[0009] The invention will be further described using drawings, where Fig.1 shows a blind slat threading device according to the invention in open state in a frontal top perspective view, Fig. 2 shows the device of Fig. 1 in a view from above with the extending teeth assemblies open, Fig. 3 shows the device of Fig. 1 in a top front perspective view with the extending teeth assemblies closed, Fig. 4 is a front view of extending teeth assembly open, Fig. 5 is a view of the extending teeth assembly from Fig. 4 in the closed position, Fig. 6 is an inside view of the extending teeth assembly in the fully open position and Fig. 7 is an external view of the extending teeth assembly in the fully open position.

Preferred embodiments of the invention

[0010] Fig. 1 is a perspective frontal top view of the blind slat threading device 1 according to the invention, in the open state, with the ladder 2 moving vertically upwards. The device 1 comprises a base 21 at the bottom, on which a mounting plate 18 is arranged. On the mounting plate 18 two supporting stands 17 are arranged opposite each other in a longitudinal direction. Between them the ladder 2 with vertical ladder cords 3 and pairs of transverse ladder strings 4 is arranged. Ladder strings 4 create a slit 5 into which the not shown slat is to be threaded in its horizontal position. Pneumatic actuator modules 16 are arranged opposite each other in the two supporting stands 17 provided with air inlets 22. Pneumatic actuator modules 16 are in fact made as pneumatic

tongs on which two assemblies 28 of jaws 6, 6' with extending teeth and half-teeth 7, 8, 9, 11, 12 are pivotally mounted. The front jaws 6 are created as rakes and the rear jaws 6' are created as a fork with two half-teeth 11, 12 shaped to complement the half-teeth 7 and 9 on the rakes at the front jaws 6.

[0011] It is obvious that device 1 consists of two mirror-symmetrical portions and, for clarity in the drawings, the reference signs are provided on only one part of the components.

[0012] Pneumatic actuator modules 16 are provided with supporting forks 19 in which not-shown pins are arranged and around these pins rotate holders 23 of the jaws 6, 6'. There are four jaws 6, 6' with extending teeth arranged in total in the device 1. The swinging of the holders 23 of the actuator module 16 is ensured by an internal device, available as a commercially supplied component. All the jaws 6, 6' have an arm 37 and are pivotally connected to the upper cover plate 36 of the supporting stand 17 via a pin 24 arranged on jaws 6, 6'. The front jaws 6 are arranged opposite each other with two centrally arranged extending teeth 8, which are provided at the top with an upper half-tooth 7 and at the bottom with lower half-tooth 9 respectively. There are gaps 27 between the upper central tooth 8 and the upper semi-tooth 7 and the lower central tooth 8 and the lower semi-tooth 9 of the front jaws 6. At the rear, the rear jaws 6' contain a top-arranged upper semi-tooth 11 and a bottom-arranged lower semi-tooth 12 and are without central teeth. The lower half-tooth 12 and the upper half-tooth 11 fit into the gaps 27 when the jaws 6, 6' are closed.

[0013] The jaws 6 and 6' are arranged so that they can rotate synchronously and in a mirror-like manner, whereas the synchronicity of the movement is ensured by means of two engaging positioning gears 15 and two gear segments 14 engaged with them, which are part of the rear jaws 6'. The gears 15 are pivotally arranged on not shown pins in the holes 20 in the mounting plate 18, and the gear segments 14 are rigidly connected at the bottom via support plate 13 to the rear jaws 6'. It can be seen in Fig. 6.

[0014] Important parts are carriers 25 of guiding grooves 10 with the needle 26 for guiding the slats, wherein the front abutting portion 34 of the carrier 25 is integral with the front jaws 6 and the rear linearly movable working portion 33 which carries the guiding groove 10 is slidable. When the assembly 28 of the jaws 6, 6' is closed, this working portion 33 is pressed against the abutting portion 34, resulting in the guiding groove 10 being brought into the working position. During the sliding, the front portion of the guiding groove 10 with the needle 26 passes through the gap 38 between the middle teeth 8. The position of the guiding grooves 10 and the needle 26 corresponds to the position of the slit 5 between the two closely spaced transverse ladder strings 4 into which the slat is to be threaded. The size of the guiding grooves 10 corresponds to the size of the gap 38 between the teeth 8.

[0015] The components to the left and and to the right from the vertical centre plane of the device 1 are mirror-like identical and mirror-like identically arranged.

[0016] In Fig. 2, as seen from above, the rear jaws 6' are provided only with an upper half-tooth 11 and a lower half-tooth 12. Also better seen here are the positioning gears 15 and the gear segments 14, by means of which the movements of the assemblies 28 of the front and rear jaws 6, 6' with the extending teeth are coupled together so that when the front jaws 6 rotate inwardly and outwardly, respectively, towards/from the center of the device 1, the rear jaws 6' also rotate inwardly and outwardly, respectively, in synchrony.

[0017] Fig. 3 shows the device 1 according to the invention when the assemblies 28 of the jaws 6, 6' are closed together in a frontal top view. A situation can be seen where the working portion of the carrier 25 is already pushed to its abutting part.

[0018] Fig. 4 and 5 show the decomposed movement of the jaws 6, 6' with the extending teeth of one assembly 28. Fig. 4 is a view of one assembly 28 of the jaws 6, 6' with the extending teeth open.

[0019] Fig. 5 represents a view of one assembly 28 of jaws 6, 6' of Fig. 4 in the closed position. When both the front and rear jaws 6, 6' are closed, the upper half-tooth 7 on the front jaw 6 and the upper half-tooth 11 on the rear jaw 6' are complemented in shape to form a single tooth corresponding in size to the middle teeth 8, which corresponds to the height of the window 31 of the ladder 2, which is formed by vertical ladder cords 3 at the sides and from below and from the top by transverse ladder strings 4.

[0020] Similarly, when the front and rear jaws 6, 6' are closed, the lower half-tooth 9 on the front jaw 6 and the lower half-tooth 12 on the rear jaw 6' are complemented in shape and also form one tooth corresponding in size to the middle teeth 8. It is obvious, that in the closed position of the jaws 6, 6' four teeth of substantially equal size are created on the left and right, the spacing, height and width of which correspond to the spacing, height and width of the individual windows 31 of the ladder 2. It can be clearly seen, how by the closing of the assembly 28 of jaws 6, 6', the half-teeth 7 and 9 are complementary in shape and dimension with the half-teeth 11 and 12.

[0021] Fig. 6 is an inside view of one assembly 28 of jaws 6, 6' in the fully open position, where the shape of the assembly 28 of jaws 6, 6' can be seen, with the extending teeth including the recess 29 in which the supporting fork 19 is arranged and which is connected to the holders 23 of jaws 6, 6' by means of the not shown connecting pins. On the lower surface of the rear jaw 6' a support plate 13 is fixed, on which a gear segment 14 is fixed from below, and which thus swings together with the jaw 6' and also drives the positioning gears 15.

[0022] To secure the position of the support plate 13, this is further attached to the supporting pin 35. It can also be seen that the gear segments 14 have grooves 32 in the shape of an arc so that the tubing 30 can pass

to the pneumatic module 16.

[0023] Fig. 7 is an external view of one assembly 28 of jaws 6, 6' in the fully open position, i.e. from the other side than in Fig. 6. It is presented, how the pneumatic actuator modul 16 is connected via supporting fork 19 to the holder 23 of the jaws 6, 6'.

[0024] It is obvious, that for the reason the half-teeth and teeth 7, 8, 9, 11, 12 accurately and at the right moment enter the windows 31 of the ladder 2, correctly extend and fix the windows 31 and at the right moment thread the slat into the slit 5 between the transverse ladder strings 4, the movement of the jaws 6, 6' of the extending teeth, the movement of the ladder 2, and the movement of the slat must be correctly synchronized with each other.

[0025] The process for threading the slats into ladder 2 using device 1 is as follows: The assemblies 28 of jaws 6, 6' are opened and the ladder 2 is moved vertically upwards. When the assemblies 28 of the jaws 6, 6' are closed, the upper half-teeth 7 of the front jaws 6 and the upper half-teeth 11 of the rear jaws 6' are driven into the upper first window 31 and are joined to form a complete tooth. At the same time, the middle teeth 8 of the front jaws 6 are driven into the second and third windows 31 of ladder 2 below the upper first window.

[0026] At the same time, when closing the jaws 6, 6', the lower half-teeth 9 of the jaw 6 and the lower half-teeth 12 of the jaws 6' are driven into the lower fourth window 31 and they complete themselves into the shape of the entire tooth. The ladder 2 has at the closure of the jaws 6, 6' defined and stabilized windows 31 and tensioned transverse strings 4 .

[0027] Afterwards, the rear linearly movable working portion 33 which carries the guiding grooves 10 is pressed against the abutting portion 34 on the jaws 6, as a result of which the guiding groove 10 with the needle 26 is brought into the working position and now the slat can be fed towards it. During the feeding, the front part of the guiding groove 10 with needle 26 passes through the gap between the middle teeth 8.

[0028] The guiding grooves 10 with the needles 26 are directed to the pair of strings 4 between the second and third windows. The integrated needle 26 has three main functions: to engage between the strings 4 and thereby spread them apart and create space for the slat, to guide the slat while preventing the ladder 2 from being cut at the critical point of contact with the edge of the slat during threading.

[0029] Needles 26 at the end of the guiding grooves 10 on the carriers 25 are directed perpendicularly into the slit 5 between the transverse strings 4, move into it and spread the strings 4. Then, the slats are driven between the strings 4 without coming into contact with the ladder 2. Then, the sliding working portion 33 of the carrier 25 with the guiding groove 10 is moved away and the jaws 6, 6' are opened again. The ladder 2 is moved vertically upwards so the position of the first upper window 31 is taken by the second window below it and the whole process is repeated until all the slats of the blind are successively threaded.

Industrial applicability

[0030] The blind slats threading device is suitable for threading thin blinds, especially inter-glass blinds, where the sharp edges of the blind slats may cause cutting or damage to the ladder into which the slats are to be threaded during the production of blinds.

[0031] List of reference signs:

1 - device
2 - ladder
3 - vertical ladder cords
4 - transverse ladder strings
5 - slit between the transverse strings
6 - front jaws of extending teeth
6'- rear jaws of extending teeth
7 - upper half-tooth of the front jaws
8 - middle teeth
9 - lower half-tooth of front jaws
10 -guiding groove
11 - upper half-tooth of rear jaws
12 - lower half-tooth of rear jaws
13 - support plate
14 - gear segments
15 - positioning gears
16 - pneumatic actuator modules
17 - supporting stands
18 - mounting plate
19 - supporting fork
20 - holes in the plate for positioning gears
21 - base
22 - air inlets
23 - jaw holders
24 - pins
25 - carriers
26 - needle
27 - gaps
28 - assemblies of jaws
29 - recess
30 - tubing
31 - window
32 - groove
33 - movable working portion of the carrier
34 - abutting portion of the carrier
35 - supporting pin
36 - cover plate
37 - arm
38 - gap between the middle teeth

Claims

1. A blind slat threading device (1) comprising a base (21) on which a mounting plate (18) is arranged and on which two supporting stands (17) are arranged

opposite each other, between which a space is arranged for vertical movement of a ladder (2) with vertical ladder cords (3) and pairs of tranverse ladder strings (4) arranged between them with a slit (5) between them, **characterised in that** each supporting stand (17) is provided with two pneumatic actuator modules (16), each stand (17) bearing one assembly (28) consisting of a front jaw (6) and a rear jaw (6'), whereas the front jaws (6) are provided with an upper half-tooth (7) at the top and a lower half-tooth (9) at the bottom and two middle teeth (8) arranged between them, wherein on the front jaws (6) carriers (25) of guiding grooves (10) with a needle (26) for guiding the slat are arranged, wherein the front abutting portion (34) of the carrier (25) is an integral part of the front jaws (6) and on the rear linearly movable working portion (33) of the guiding grooves (10) are arranged, wherein the size of the guiding grooves (10) corresponds to the size of the gap (38) between the middle teeth (8), the rear jaws (6') are provided with an upper half-tooth (11) at the top and a lower half-tooth (12) at the bottom, whereas between the upper half-tooth (7) and the upper middle tooth (8) and the lower half-tooth (9) and the lower middle tooth (8) of the front jaws (6) gaps (27) are arranged, against which dimensionally corresponding upper half-tooth (11) and lower half-tooth (12) on the rear jaws (6') are arranged, whereas the jaws (6, 6') are pivotally connected to the upper cover plate (36) of the supporting stand (17) via an arm (37) and a pin (24) arranged thereon, and at the same time via a holder (23) which is part of the pneumatic actuator module (16) with a supporting fork (19), wherein holes (20) are created in the mounting plate (18), whereas in the holes (20) two positioning gears (15) are rotatably arranged, which engage with gear segments (14) which are fixed via a support plate (13) to the lower part of the rear jaw (6').

2. The blind slat threading device according to claim 1, **characterized in that** arc-shaped grooves (32) are created in the gear segments (14) for the passage of tubing (30) to the pneumatic actuator modules (16).

3. The blind slat threading device according to claims 1 and 2, **characterized in that** the support plate (13) is attached to a supporting pin (35) also arranged at the bottom of the rear jaw (6').

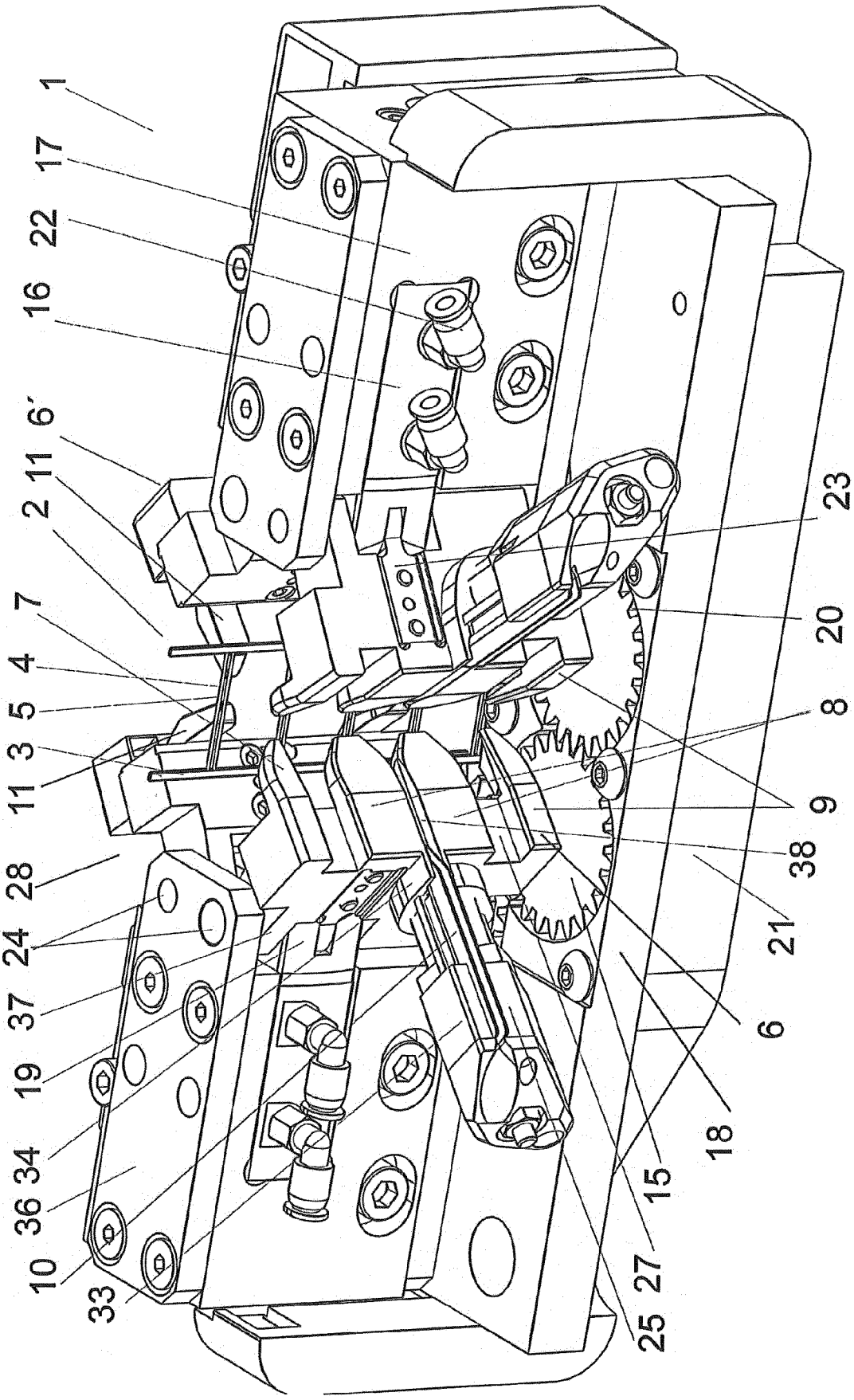
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Fig. 1

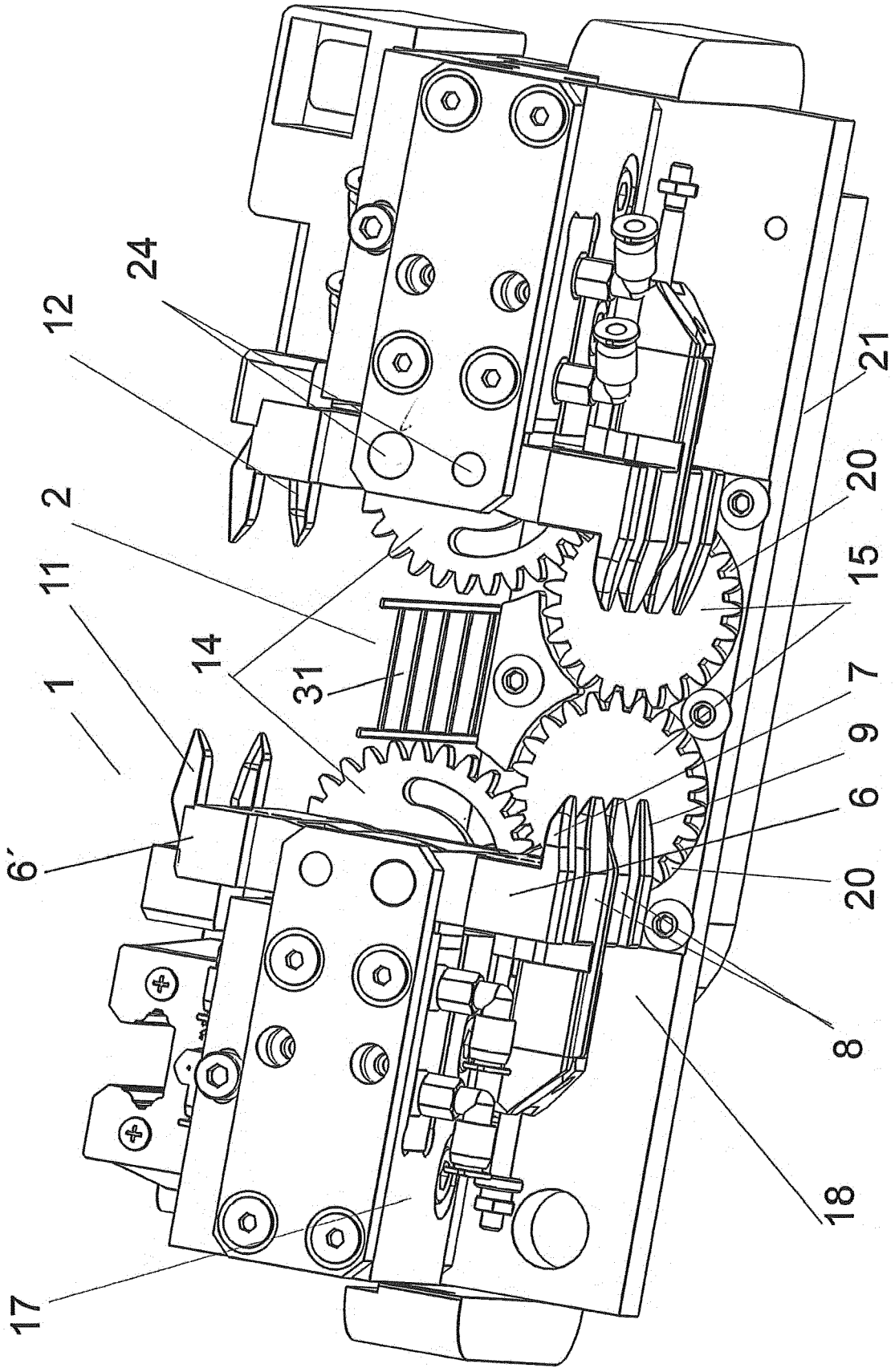

Fig. 2

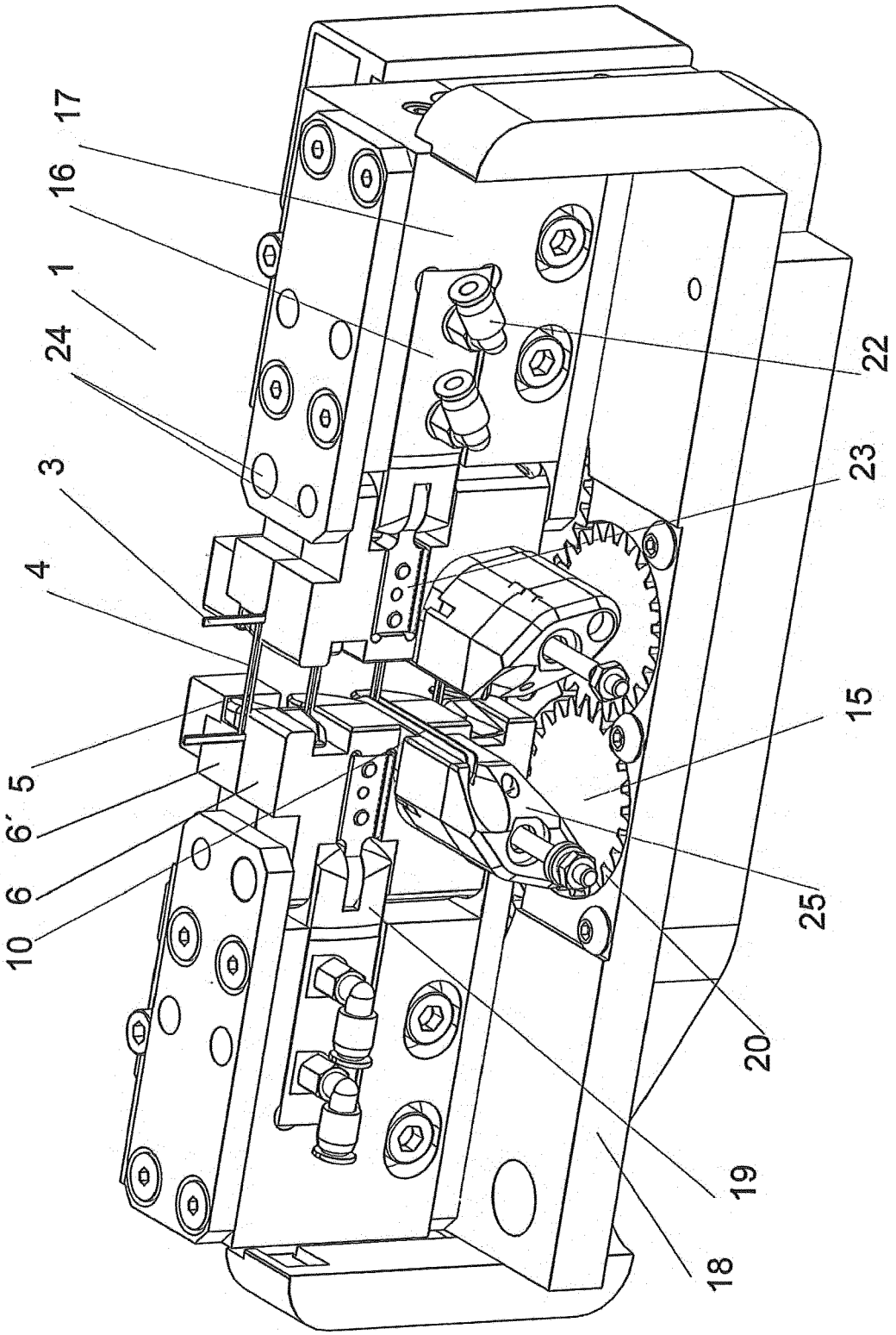

Fig. 3

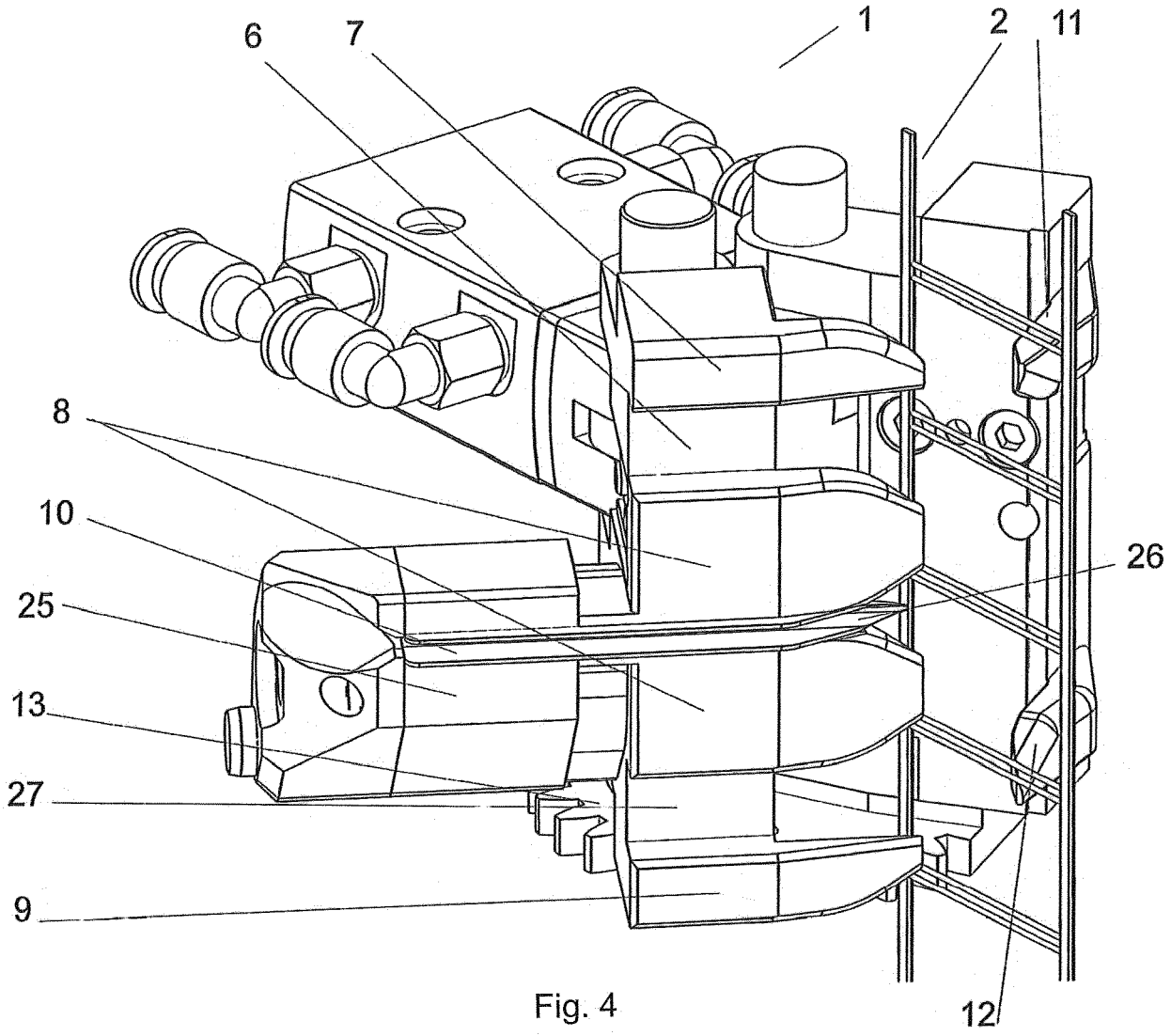

Fig. 4

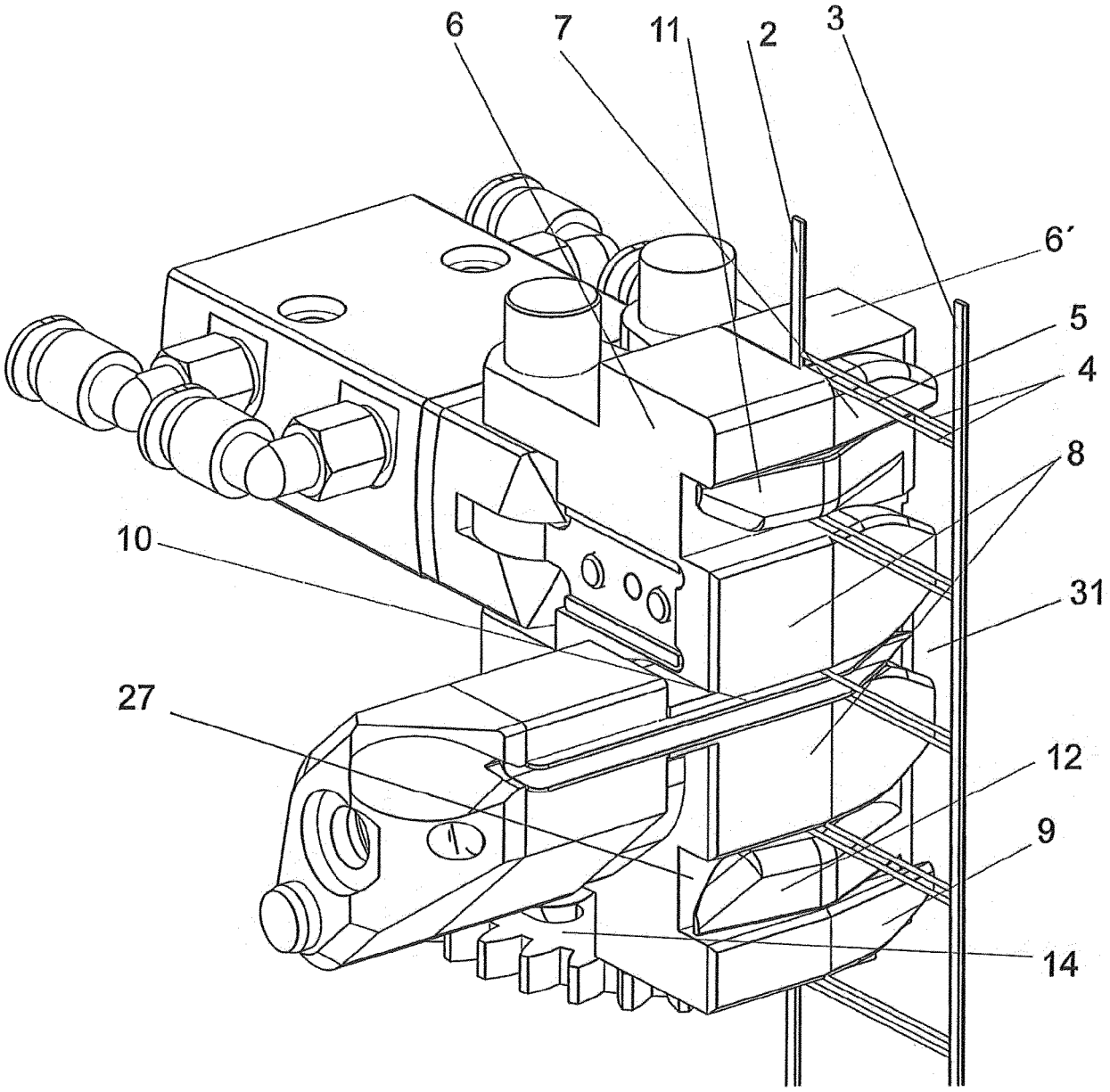

Fig. 5

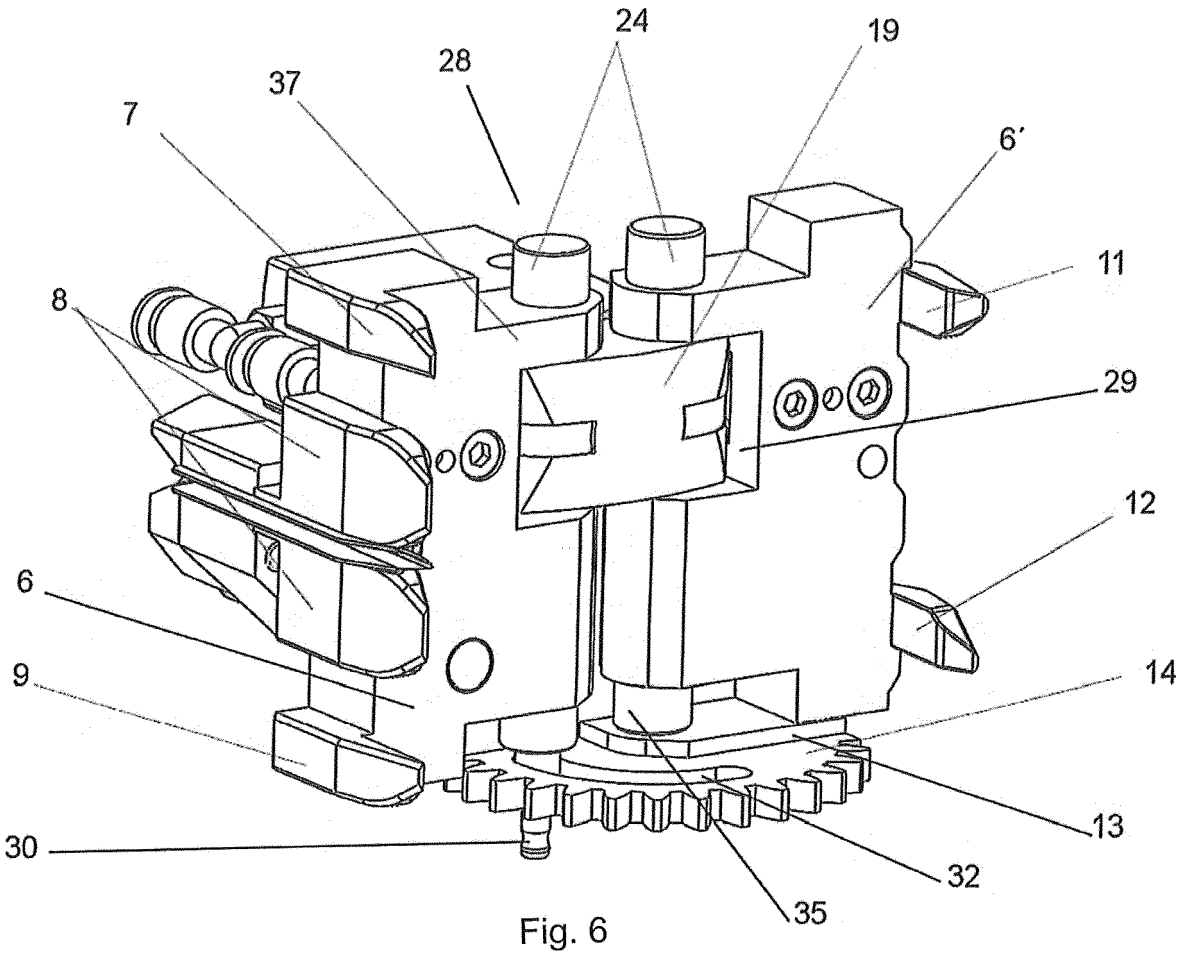

Fig. 6

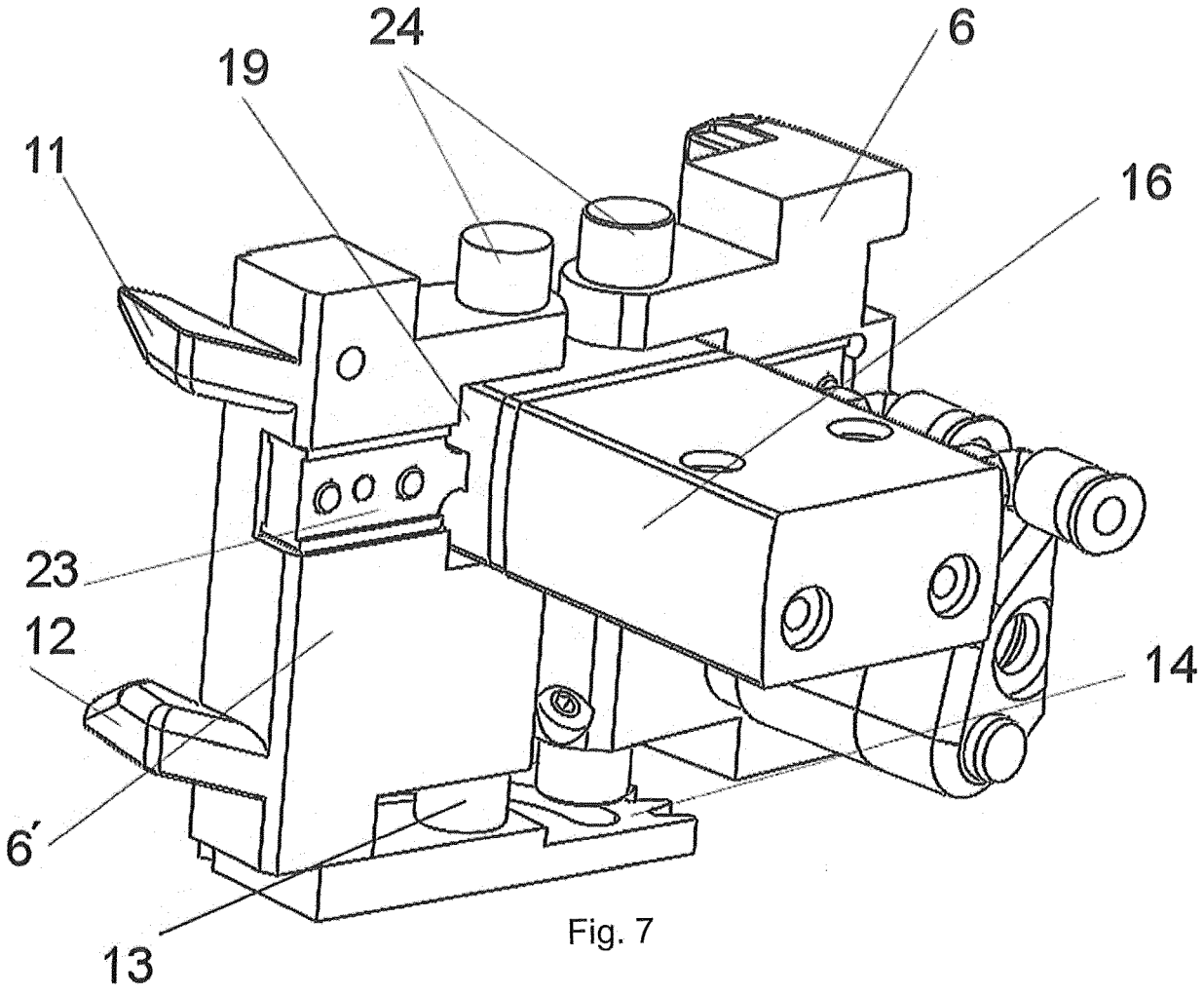

Fig. 7