(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 459 821 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.09.2004 Bulletin 2004/39

(51) Int Cl.[7]: **B21D 53/74**

(21) Application number: **04101119.8**

(22) Date of filing: **18.03.2004**

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

(30) Priority: **18.03.2003 IT FI20030071**
08.08.2003 IT FI20030217

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(54) Device for crimping machine

(57) This is a description of a device for a crimping machine equipped with moving parts (14) that enable easier positioning of the knives, and is also a description of a mobile knife for a crimping machine.

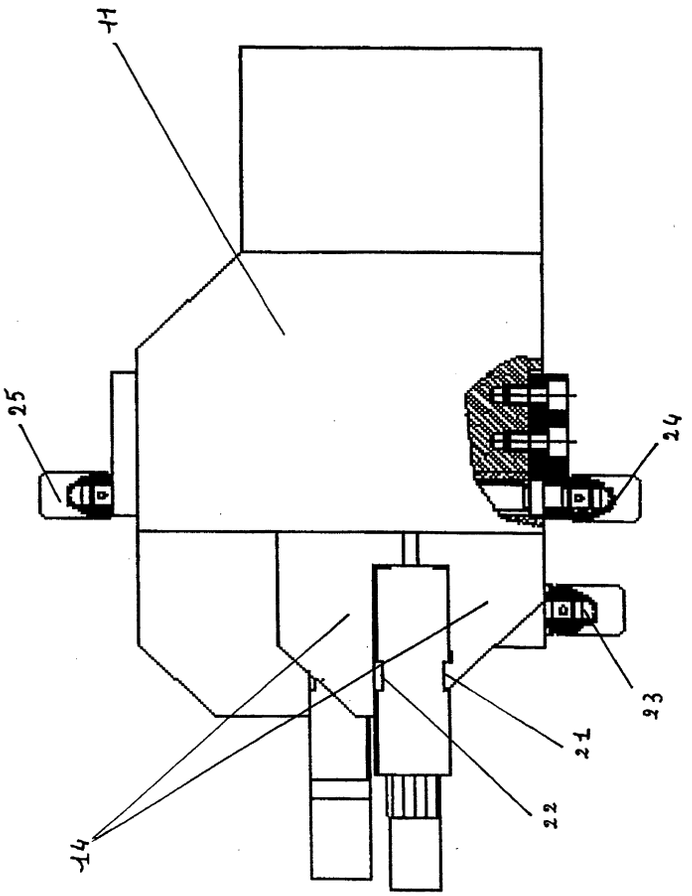

FIG. 2

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Description

Field of the invention

[0001] This invention regards the field of machine tools and, in particular that of crimping machines.

State of the art

[0002] It is a well known fact that crimping is an operation which consists in coupling, using a connecting square, the two metal profiles that form the corner of a metal frame for fixtures (such as a door or a window).

[0003] Machines for carrying out the abovementioned operation consist mainly of a fixed seating (equipped with runners, clamps, etc), into which the profiles to be crimped and two moving groups (known as "thrust mass groups" or crimping heads) are fitted, and to which the knife (knives) or crimping punches are applied.

[0004] The thrust mass groups are connected using a screw/female screw system or other means of connection, to a runner (part of the crimping machine seating) which enables it to run parallel to the profile to be crimped, thus making it possible to position them in the point required.

[0005] The crimping head is connected to the runner for positioning.

[0006] The runner is connected to moving equipment which carries out the punching movement.

[0007] The tools on the heads take care of the necessary deformation of the walls of the profiles so that they engage against the corresponding buffers of the square, thus ensuring the formation of the corner.

[0008] Normally at least one pair of punches is required for each square. The punches are housed on the crimping heads and deform, partially cutting, the profile in line with specific channels.

[0009] In order to obtain perfect crimping, it is obvious that the knives must positioned very precisely so that as the profile is deformed, it engages exactly in the channels on the square.

[0010] It is possible to buy profiles made up of two or more "tubular pieces" which require two or more squares in order to be joined. As the squares of the two chambers usually have the channels in different positions and the two chambers are usually uneven, when a knife (usually the lower one) is positioned correctly, it doesn't necessarily mean that the second knife, with the same dimensions on the plan, is in the right position, so it becomes necessary to replace the second knife (usually the upper one) with a specially shaped knife in order to reach the second deformation point.

[0011] In an attempt to overcome this problem, it was tried to give the upper knives on the heads an extra degree of freedom (in addition to that consented by the runner along which, as mentioned earlier, the thrust mass moves), equipping the crimping head group with a part which is free to move along an axis set on a horizontal surface with a suitable inclination, as described in the German patent DE 4 307 893; but even this measure doesn't make it possible to obtain a satisfactory position for all types of two chamber profiles, only on particular geometries of squares.

[0012] Further improvement of the devices in question is therefore required in order to carry out the crimping operation quickly and safely on every type of profile and square.

Abstract of the invention

[0013] The invention refers to a device for a crimping machine which enables the regulation of the knives on four independent axes, thus permitting universal positioning of the knives regardless of the type of profile or squares used.

Description of figures

[0014]

Figure 1 shows the plan and the cross-section of a device according to the invention, without knives.
Fig. 2 shows the previous view with two knives assembled.
Fig. 3 shows a detailed view of a knife according to the invention.
Fig. 4 shows a detailed view of the runner of the device according to the invention.
Fig. 5 shows a detailed view of the device according to the invention.
Figures 6 - 10 show particular versions of the device according to the invention, in which the head is fixed, with views from above (a) and the side (b) with cross sections.
Fig. 11 (a - f) shows the details of a device according to the invention, in which all the movements of the knives are carried out by screws, with views from above and the side and in with cross section.
Fig. 12 (a - f) shows the embodiment according to the invention in which the crimping heads are divided into two distict part; in particular Fig. 12a shows the embodiment as a whole while fig. 12(b-f) are particular views as indicatde by arrows C, D, H, F, G in Fig, 12a and I, H in Fig. 12 f).
Fig. 13 (a -d) shows the embodiment according to the invention wherein each crimping knife is supported by a plate.
Fig. 14 (a -c) shows the motorisation of the embodiment accordiing to fig. 11 (a-f).

Detailed description of the invention

[0015] According to a first embodiment of the invention the crimping heads is divided into two distinct part each allowing to adjust the position of the knife.

[0016] As it can be see from Fig. 12 (a - f) the lower

knife 77 is fixed by a clamp 78 to a plate 79 of a slide 80 that runs by suitable bearings 82 on cylindrical guides 81 and 81' and therefore can move the knife vertically.

[0017] The sliding motion is due is due to a thread bar that is coupled with a lead screw fixed to the slide 80 and with the ends supported by the frame 83. The thread bar ends are constrained by the frame 83 in such a way as to allow the thread bar rotation, by a handle 84, but not translation of the thread bar.

[0018] The frame 83 is a strong body with a base that is a slide running on a guide 84. The slide allows the frame 83 motion along direction of the aluminium profile axis. The aluminium profile belongs to the angle of a window frame that has to be crimped.

[0019] The frame motion is due to a thread 85 that is coupled to a lead screw 86 fixed to the frame 83. The thread bar ends are constrained by the guide 84 in such a way as to allow the thread bar 85 rotation only. A handle, at the thread bar end, allows moving the frame 83.

[0020] A clamp 88 to a plate 89 of a slide 90 fixes the upper knife 87. The slide motion is along the direction (named "X" axis") of knife crimping. The slide 90 runs by bearings 91 on two guides 92 supported by a mobile body 95 (vertical slide). A thread bar 93, constrained by the vertical slide in such a way as to allow by a handle 94 to move the slide 90 because the thread bar is coupled to the lead screw fixed to the slide 90.

[0021] The vertical slide 95 by the bearings 96 runs on the guides 97 and 97' vertically. The vertical motion is due to the thread bar 98 that is coupled to the lead screw 99 fixed to the slide 95.

[0022] The thread bar ends are supported by the frame 100 in such a way as to allow the rotation only. A handle 101 can rotate the thread bar.

[0023] A slide in the frame 106 is coupled with the guide 84. The slide allows the frame 100 motion along the aluminium profile axis direction belonging to the angle that has to be crimped. The frame motion is due to a thread bar 103 coupled to a lead screw 102 fixed to the frame 100. The thread bar ends are supported by the guide 84 in such a way as to allow the rotation only. A handle fixed to the thread bar can move the frame 100.

[0024] The device as described can be easily improved by permitting the positioning of the inferior knife also along the axis X, it suffice in fact to replace the abovementioned frame of the lower knife with a frame with the same functions of the upper knife device above mentioned, with this embodiment each knife can be positioned along three axes.

[0025] According to a second embodiment of the invention (see fig 13 (a - d)) each knife is supported by a plate, and two plates, one upon the other, can move vertically along guides disposed on walls 115 - 115' of a frame A containing the whole device (see Fig. 13 a).

[0026] The lower knife 103 is fixed by a clamp 104 to the slide 105. The slide 105 runs along Y1 direction parallel to the aluminium profile axis, on linear guides 106 e 106' by ball carriages 107. The thread bar 109 is fixed to the slide 105. The slide 105 motion is due to the lead screw 108 that is coupled with the thread bar 109. The lead screw 108 is constrained by the block 110 in such a way as to allow to the lead screw rotation but not translation. The gearmotor 111 by a belt and two pulleys (one of them is 112) can rotate the lead screw 108. The linear guides 106 and 106', the block 110 and gearmotor 111 are fixed to the plate 113 that by ball carriages 114 and 114' can run vertically on linear guides. These linear guides are fixed to the walls 115 and 115' of the frame A.

[0027] The upper knife 116 is fixed to the slide 117 by the clamp 118. The slide 117 by ball carriages 118 runs on the linear guides 119 and 119' along crimping direction (axis X). The slide 117 motion is due to the thread bar 120 that is coupled with the lead screw 121 fixed to the block 122 that is fixed to the slide 117. The thread bar 120 is constrained by the block 123 in such a way as to allow thread bar rotation but not translation. The thread bar 120 rotations is due to gearmotor 124 jointed to the thread bar by a belt ad a couple of pulleys. Linear guides 119 and 119', the gearmotor 124 and the block 123 are fixed to the slide 125. This by ball carriages 126 running on linear guides 127, can move along Y1 direction parallel to the aluminium profile axis. The thread bar 128 is fixed to the plate 129 fixed to the slide 125. The slide 125 motion is due to the lead screw 130 that is coupled with thread bar 128.

[0028] The lead screw 130 is constrained by the block 131 in such a way as to allow lead screw rotation but not translation. The gearmotor 132 by a belt and two pulleys (one of them is 133) can rotate the lead screw 130. The linear guides 127, the block 131 and gearmotor 132 are fixed to the plate 134 that by ball carriages 135 and 135' can run vertically on linear guides. These linear guides are fixed to the walls 115 and 115' of the frames.

[0029] The vertical motion is due to a thread bar that is coupled with a lead screw fixed to the plate 113. The thread bas end is supported by a suitable block that allows only thread bar rotation. Thread bar rotation is due to a gearmotor. Gearmotor and the block are fixed to the upper part 136 of the frame A.

[0030] According to a further embodiment of the invention, making reference to figures 1,2 and 4, the crimping head group 10 (also referred to as the head) includes a part 11, to which the hooking device 12 is applied, consenting movement along the runner 27 applied to the base of the crimping machine.

[0031] Said part 11 has a clamp 13, attached by mechanical fastenings 15, such as screws and bolts, and made up of two jaws 14 capable of running towards or away from each other, activated by screws which can rotate but not translate (we will call these manoeuvre screws) 16, inserted into the clamp and protruding from it, which engage on the base of the jaws 14.

[0032] The two jaws 14 can move together or separately. Obviously in the former case there will be just one manoeuvre screw, with two in the second case.

[0033] The version in which the two jaws 14 are able

to move separately is obviously preferable as it allows greater freedom when positioning the knives.

[0034] In a particular version of the invention, as shown in Fig. 5, the two jaws that hold the upper knife can be replaced by a U-shaped knife holder 14', which contains a clamp 15' for locking the knife with an extensible blade, as described below. The knife holder 14' is capable of moving along an axis perpendicular to the longitudinal axis of the knife thanks to a screw activated by a ratchet 16'. The lower knife is of the usual type and is locked as described below.

[0035] The crimping head group 10 is obviously free to move along the runner 27 parallel to the profile to be crimped.

[0036] The knife according to the invention 17, as shown in Figure 1, which performs the crimping action, has a base 18 in which there is a threaded seating 19, inside which a manoeuvre screw 20 operates, enabling movement in a longitudinal direction.

[0037] The lower knife is locked by the single jaw activated by the screw 26, which is connected to the element 23.

[0038] The upper knife, shown in fig. 3, is held in the correct longitudinal position thanks to the engagements 21 which couple with the corresponding engagements 22 on the inner part of the jaws 14; the elements 24 and 25, which are part of the screws 16, enabling the hand-operated approach of the jaws 14, can also be hooked up by normal spanners to be tightened to lock the knife in place.

[0039] The operation of the device and its advantages are immediately obvious.

[0040] In addition to the translation movement along the runner 17 fastened to the base of the crimping machine (already present in state of the art solutions), the jaws 14 enable movement of the knife in the direction transversal to the abovementioned runner and, lastly, the knife can also be moved along an axis perpendicular to the clamp; these three movements make it possible to position the knife according to any requirement and to quickly and precisely perform the crimping operations in the point necessary on any square and/or length without constantly changing knife or performing laborious adjustments.

[0041] It is also possible to manually move the knives upwards, opening the jaws and sliding the knife in the space between the jaws; therefore the knives can be moved according to a total of 4 independent axes, as stated above.

[0042] In another version of the invention, the head 10 cannot be regulated and can only perform the crimping movement along the knife axis, just like all existing crimping heads.

[0043] In this version - see Fig. 6 (a) and (b) (seen from above and the side), the front part 28 of the head 10 is oriented parallel to the profile to be crimped.

[0044] On this front part there are two female T-shaped runners 29 (see figure 6 (b)), positioned parallel to the profile, on which two U-shape knife holders 30 (being equipped with similar male T-shaped runners 29) engage, with one for the lower knife (of the existing type, with fixed length and width) and one for the upper knife (17, as described above).

[0045] The knife holders can be moved using a screw system as described above, and also enable manual movement of the knives along a vertical axis perpendicular to their direction of movement (in other words, perpendicular to the plan shown in Figure 6), the clamp 31 in the knife holder makes it possible to lock the upper knife.

[0046] Another version of the invention is shown in Fig. 7 (a) and (b) (seen from above and from the side, with cross section).

[0047] In this case too, the head 10 cannot be regulated and can only perform the crimping moving along the knife axis. There is a vertical channel 32 with a rectangular section on the wall of the head, in which a vertically running element 34 engages thanks to an appendix 33 which has a T-shaped cavity. On the front of said element 34, there is a T-shaped transversal channel 35 which enables movement parallel to the profile of the knife engaged in it.

[0048] There can be two of these elements and in this case the lower one will hold the standard knife, while the upper element will hold the knife 17 as described above.

[0049] The locking and release of the elements 34 to and from the head takes place using screws 55 screwed to the rectangular section bar 56, which engages in the T-shaped cavity of the appendix 33.

[0050] The two knives are locked by screws 57 and nuts 58 inserted inside the T-shaped channel 35.

[0051] In another version of the invention (see Fig. 8 (a) and (b) seen from above with cross-section and from the side with cross-section) the element 34 can have a channel 36 in the front, enabling the movement of a knife along an axis perpendicular to the longitudinal axis of the knife.

[0052] In this case there can be two elements 34 in the vertical channel 32 and the knives used will always be knives 17 as described above.

[0053] The locking and release of the element 34 and of the knives takes place as described earlier.

[0054] Another version of the invention envisages the use of existing knives only. In this case (see Figure 9 (a) and (b) seen from above and from the side), the knife that caulks the lower chamber of the profile is housed in a knife holder 37 equipped with a jaw 38 activated by a bush 39 which, acting on a screw, enables the movement and positioning of the knife according to an axis perpendicular to the plan.

[0055] Said knife holder 37 can be moved parallel to the profile by the bush 40, which acts on a screw engaged on the rear of the knife holder, running along a channel 41 in the head 10 and arranged parallel to the profile.

[0056] The knife that caulks the upper chamber is

housed in a knife holder 42 which allows the movement along an axis perpendicular to the surface of the figure as described above. The upper face of said knife holder 42 has a channel 47.

[0057] A mechanism made up of the wedge 43 and the screw 44 engaged with it enables the movement of the knife holder 42 along the longitudinal axis of the knife. Said wedge 43 engages with the knife holder 42 and with a slide 45 with a channel 59.

[0058] The screw can rotate 44, but cannot translate with respect to the slide 45, and the wedge can move in the direction of the axis of the screw along the channel 59 of the slide 45.

[0059] A runner bar 46 fastened to the slide and running along the channel 47, with a section the same as that of the bar 46, enables the movement of the knife holder along the longitudinal axis of the knife.

[0060] The slide 45 is moved by a screw, activated by the bush 48, which enables its movement parallel to the profile along a second channel 49 in the head 10.

[0061] In this case the head 10 has just one working movement but no movement for positioning the knives which is performed manually by the operator.

[0062] In a variant of this version of the invention (see Fig. 10 (a) and (b) seen from above and from the side) it is possible to envisage a block 50 in which there is a channel parallel to the profile in which the knife holder is free to move, driven by a screw activated by the bush 51.

[0063] The block 50 can also move along the longitudinal axis of the knife thanks to a screw 52 activated by the bush 53.

[0064] Two runner bars 54 forming part of the block 50, allow the movement, running in special slots in the part 55 of the head 10.

[0065] A final description is given of a last version of the invention, in which all the movements of the knives are performed by screws.

[0066] In this particular version of the invention (see Figure 11 (a) seen from above and in cross-section) there is a T-shaped runner 64 on the side of the head, arranged parallel to the profile to be crimped.

[0067] The blade of the upper knife 60 (see figure 11 (f)) is supported by a blade holder 61, the rear part of which has a T-shaped channel 63 which enables the blade holder 61 to engage with the runner 64, with a female screw on the base 68.

[0068] A screw 62 enables the movement of the knife blade along its longitudinal axis.

[0069] The movement of the blade holder 61 along the runner 64 takes place by way of a screw 65 (see figure 11 (b) seen from above with cross-section) held in place by a barbed bush 66 set at the end of the thread. The head of the screw 65 and the bush 66 rotate freely in seatings set in the posts 67 which are held in place with screws at both ends of the runner 64. The screw 65 is coupled with the female screw 68.

[0070] In the same way, the lower knife 60' (see figure 11 (c) seen from the side with cross-section), which is of fixed size, is coupled to a second runner 64', identical to the one described above, by way of a T-shaped channel, and moved along it by the screw 69.

[0071] Both the runners 64 and 64' described above engage with a vertical T-shaped channel 70 in the head 10.

[0072] The movement along the axis perpendicular to the surface is obtained (see figure 11 (d) front view) thanks to the coupling of the runner 64 with the screw t1 by way of the female screw 72 and the coupling of the runner 64' with the screw 73 by way of the female screw 74. The hole 75 prevents the screw 73 from having to engage with the runner 64; in the same way, the hole 76 prevents the screw 71 from having to engage with the runner 64' (see fig. 11 (e) seen from above with cross-section).

[0073] The various parts will be moved using the usual systems adopted on this type of machine.

[0074] All the movements of the knives, runners etc. described in the various embodiments of the invention mentioned above can be automatised with hydraulic, pneumatic and electric actuators.

[0075] In particular, the embodiment illustrated in the above described Fig. 11 (a-f), according to a further particular embodiment of the invention, can be motorised.

[0076] For this particular embodiment according to the present invention reference is made to Fig. 14 (a -c).

[0077] In this case the lower knife 137 is set on the knife holder 138 which moves along the support runner139, in a direction parallel to the piece to be crimped (axis Y1 in Fig. 14), moved by the threaded bar 140 which engages with the female screw of the support 138.

[0078] The rotary movement of the bar 140 is driven by the gearmotor 141 by pulleys and belts.

[0079] The movement is controlled by the position transducer 142 by way of cogwheels connected to the threaded bar 140.

[0080] The support 139 moves along the runner 143 fastened to the head 144.

[0081] The movement of the support 139 in the direction perpendicular to the surface is transmitted by the threaded bar 145 which engages with the female screw of the support 139 and is moved by the gearmotor 146 by way of special pulleys and belts.

[0082] The movement is controlled by the rotating position transducer 147 which is connected to the threaded bar 146 by cogwheels.

[0083] Lastly, the knife 148, supported by the knife holder 149 in a special housing which allows movement along the longitudinal axis of the knives (axis X in Fig. 1), has an appendix 150 which extends from it and has a female screw which engages with the threaded bar 151.

[0084] Said threaded bar 151 is connected by belts and pulleys to the shaft 152 one end of which is in turn connected to the rotating position transducer 153 and

the other end of which is connected to the gearmotor 154.

[0085] The block made up of the knife holder 155, the gearmotor 154 and the transducer 153, moves along the runner 156 of the support 157'.

[0086] The movement of the knife holder 155 in the direction parallel to the profile to be crimped (axis Y1 in Fig. 14) is driven by the threaded bar 158 which engages with the female screw of the knife holder 155. The threaded bar 159 is rotated by the gearmotor 157 by way of pulleys and belts.

[0087] In this case the movement is controlled by the rotating position transducer 160 which is connected to the threaded bar 145 by cogwheels.

[0088] The support 157' moves along the runner 143 fastened to the head 144.

[0089] Its movement in the direction perpendicular to the surface of the figure is driven by the threaded bar 161, which engages with the female screw of the support 157' and is moved using belts and pulleys by the gearmotor 162.

[0090] The movement is controlled by the rotating position transducer 147' which is connected to the threaded bar 161 by cogwheels.

[0091] Preferably, to minimise problems regarding space, the above mentioned gearmotors are positioned behind the head 144 and fastened by a post to support 139 and support 157' respectively.

[0092] Obviously the movement described can also be applied to crimping machines with jaws instead of the screw/runner movement; however, in this case it will be necessary to replace the jaws with vertical runners (dovetailed or similar) and apply a hydraulic cylinder or a linear electric motor for movement.

[0093] If required, the various gearmotors that transmit the movement to the moving parts as described above, can be connected to a computer that controls the various movements according to a pre-set program.

[0094] All the movements of the knives, runners, etc., described in the various versions of the invention mentioned above can be automated with hydraulic, pneumatic and electric actuators.

Claims

1. Device for crimping machine which enables the movement of crimping knives on four separate axes.

2. Device according to Claim 1 wherein the crimping heads are divided into two distict part each allowing to adjust the position of the knife.

3. Device according to Claim 1 wherein each crimping knife is supported by a plate.

4. Device according to claim 1, made up of a thrust mass group (10) comprising a clamp (13).

5. Device according to claims 1 and 4, in which the clamp (13) has two jaws (14) capable of running towards or away from each other and equipped with engagements (22) for positioning the knife.

6. Device according to claim 5, in which the running of the jaws (14) is allowed by manoeuvre screws (16) inserted in the clamp (13) and protruding from it, which engage on the base of the jaws (14).

7. Device according to claim 6, in which the two jaws (14) of a clamp each move separately.

8. Device for crimping machine with a fixed head in which, on the front part (28) of the head (10) directed parallel to the profile to be crimped, there are two female T-shaped runners (29), positioned parallel to the profile, on which two U-shape knife holders (30) (equipped with similar male T-shaped runners (29)) engage, with one for the lower knife (of the existing type, with fixed length and width) and one for the upper knife (17).

9. Device for crimping machine with a fixed head in which, on the front part of the head, there is a vertical channel (32) with a rectangular section, in which an element (34) engages by way of an appendix (33) with a T-shaped cavity, on the front of which there is a T-shaped transversal channel (35) which enables movement parallel to the profile of the knife engaged in it, and in which the screws (55) screwed to the rectangular section bar (56) which engages in the T-shaped cavity of the appendix (33), enable the locking and release of said element (34).

10. Device according to claim 9, in which only knives with an adjustable length (17) are used, in which the front of the element (34) has a channel (36) which enables the movement of the knives along an axis perpendicular to the longitudinal axis of the knives.

11. Device for crimping machine with a fixed head in which only knives with a fixed length are used, in which the knife which caulks the lower chamber of the profile is housed in a knife holder (37), with a jaw (38) activated by the bush (39), and can be moved parallel to the profile by the bush (40), which acts on a screw engaged in the rear part of the knife holder, running along a channel (41) in the head (10) and arranged parallel to the profile, and in which the knife which caulks the upper chamber of the profile is housed in a knife holder (42) the upper face of which has a channel (47) and is moved along the longitudinal axis of the knife by way of a mechanism composed of the wedge (43) and the screw

(44); said wedge (43) engaging with a knife holder (42) which, on a slide (45) with a channel (59), is free to move in the direction of the axis of the channel (59) in the slide (45), while a runner bar (46) fastened to the slide and running along the channel (47), having a section the same as that of the bar (46) enables the movement of the knife holder along the longitudinal axis of the knife.

12. Device according to claim 11 in which there is a block (50) in which there is a channel parallel to the profile in which the knife holder is free to move, driven by a screw activated by the bush (51), the block (50) also being able to move according to the longitudinal axis of the knife, activated by a screw (52) activated by the bush (53) while two runner bars (54), which are part of the block (50), consent the movement, running in special slots in the part (55) of the head (10).

13. Device for crimping machine with a fixed head, in which all the movements of the knives are performed by way of screws, and in which, on the face of the head (10) there is a T-shaped runner (64) arranged parallel to the profile to be crimped and the blade of the upper knife (60) is supported by a blade holder (61), on the rear of which there is a T-shaped runner (64), with a female screw (68) on the base, while a screw (62) allows the movement of the blade of the knife along its longitudinal axis and the lower knife (60'), coupled by way of a T-shaped channel to a second runner 864') identical to the one described above and is moved along it by the screw (69), both of said runners (64) and 64') engaging in a T-shaped channel (70) in the head (10).

14. Device according to Claim 13 wherein the movements of the moving parts are performed by gear motors.

15. Crimping knife (17) comprising a base (18) in which there is a threaded seating (19), inside which a manoeuvre screw (20) operates, enabling movement in a longitudinal direction.

16. Knife according to claim 15 with engagements (21) capable of coupling with the engagements (22) of the jaw (14) and a locking pin or screw (23).

17. Crimping machine equipped with a device according to claims 1 - 14.

18. Crimping machine equipped with a knife according to claims 15 -16.

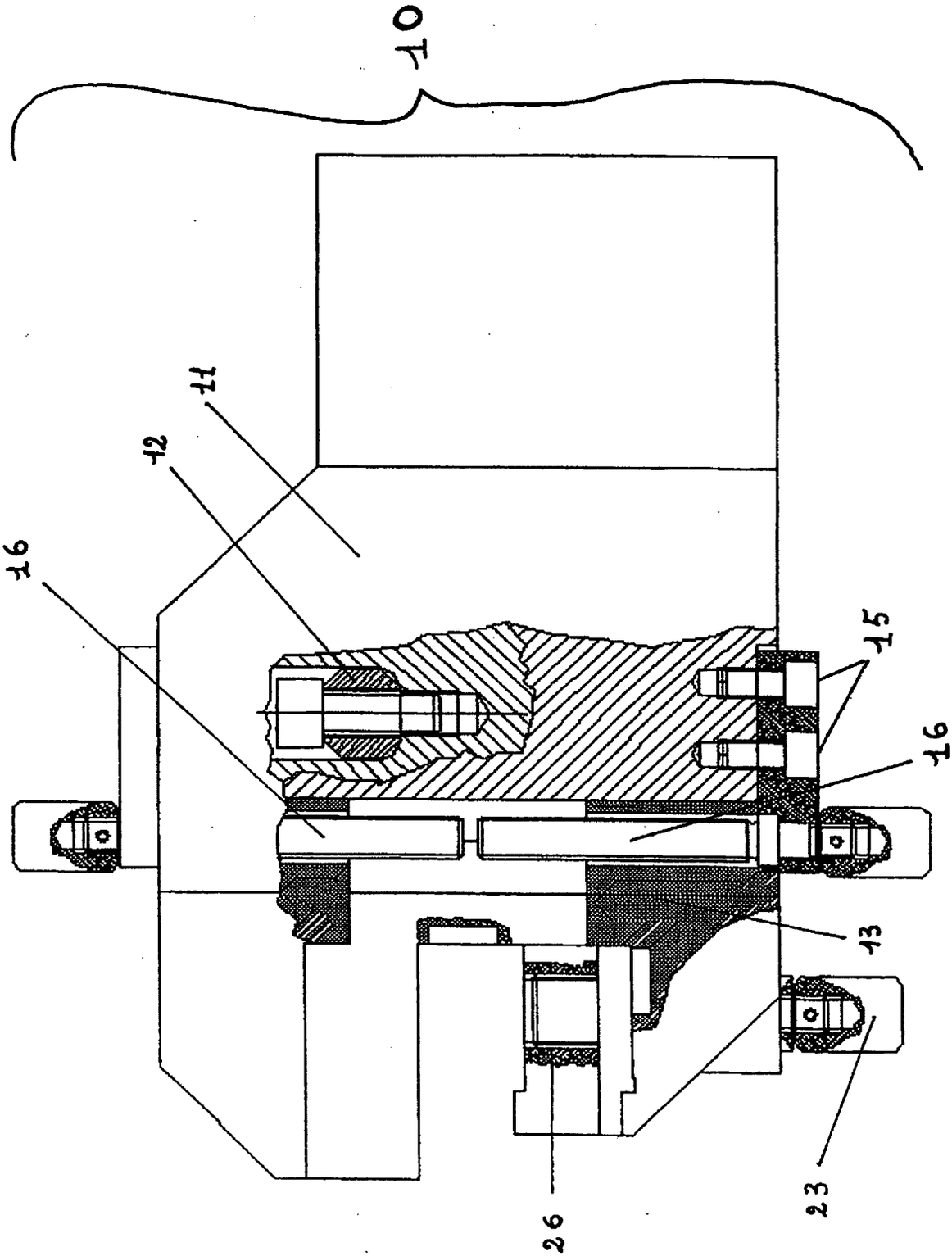


FIG. 1

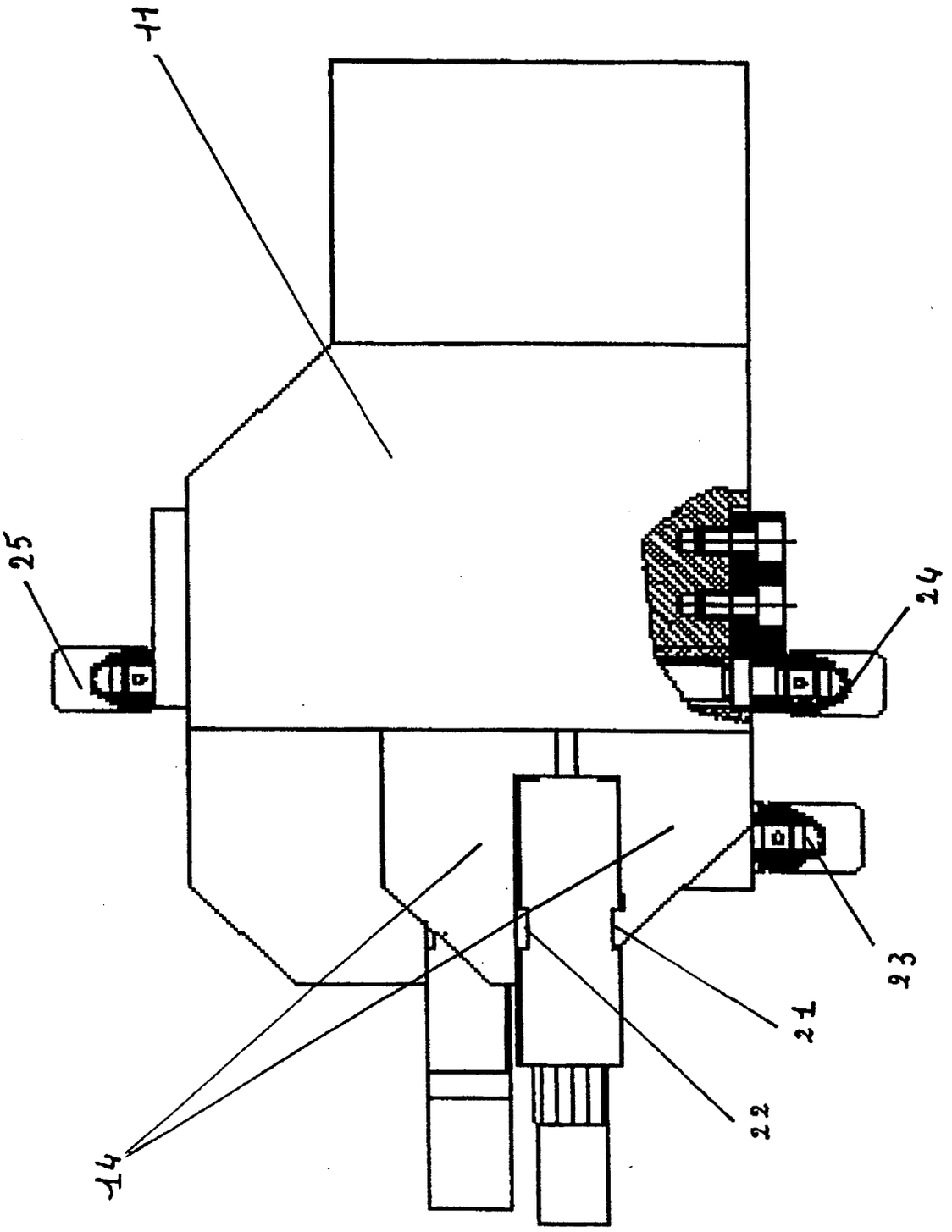


FIG. 2

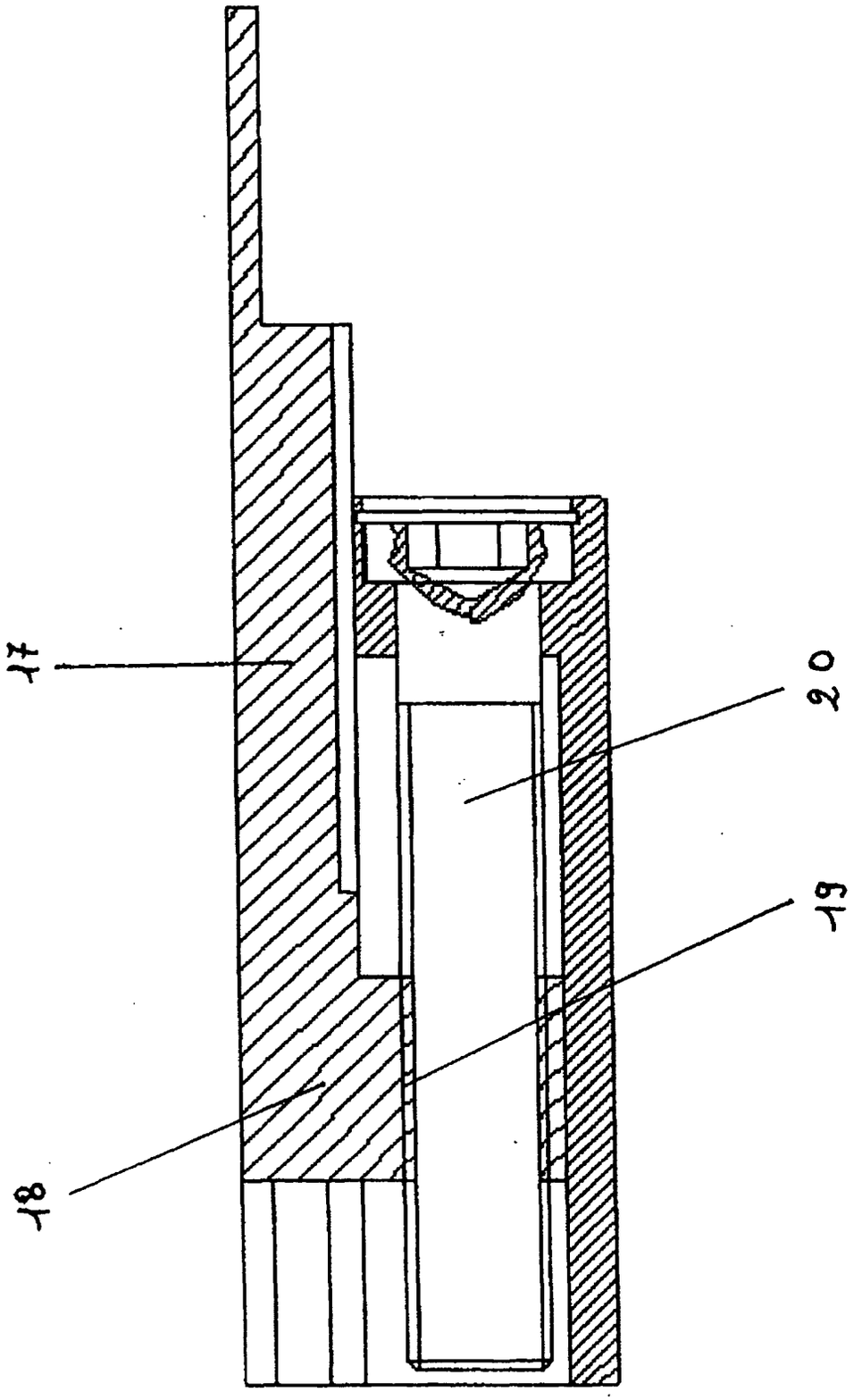


FIG. 3

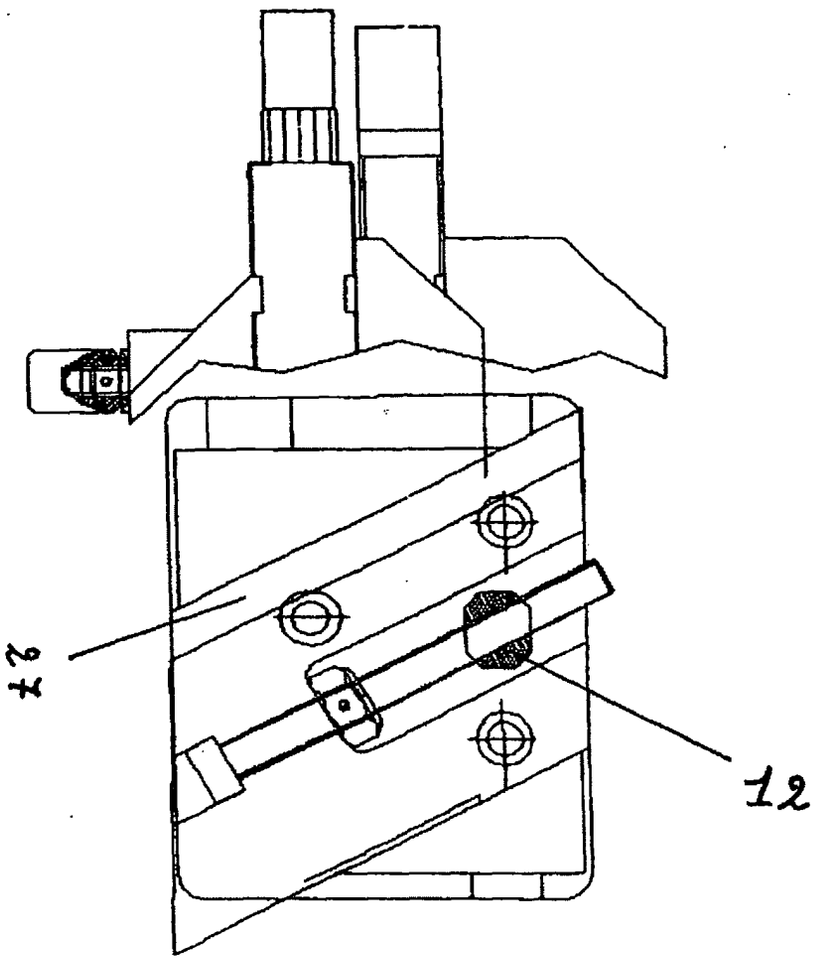


FIG. 4

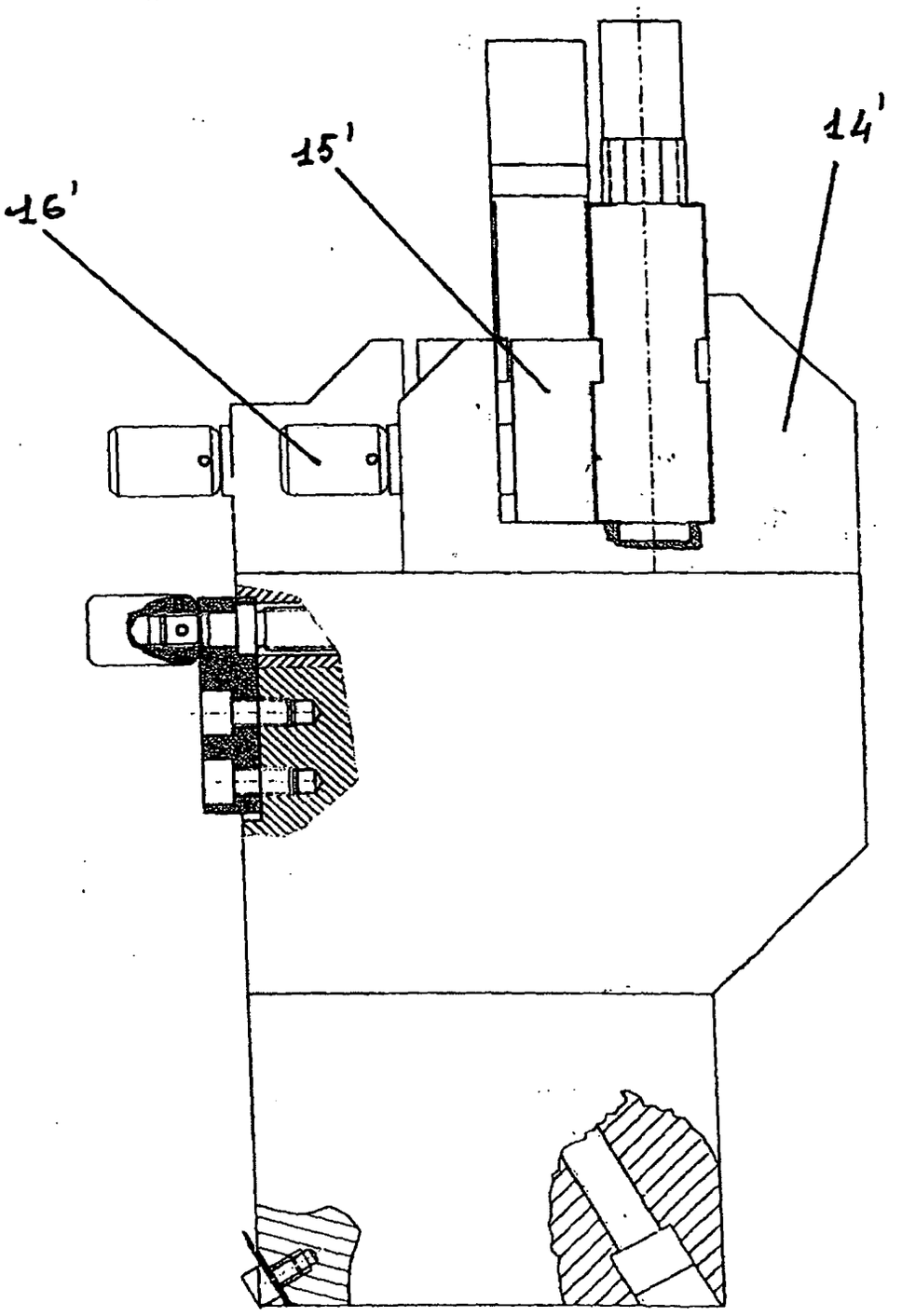


Fig. 5

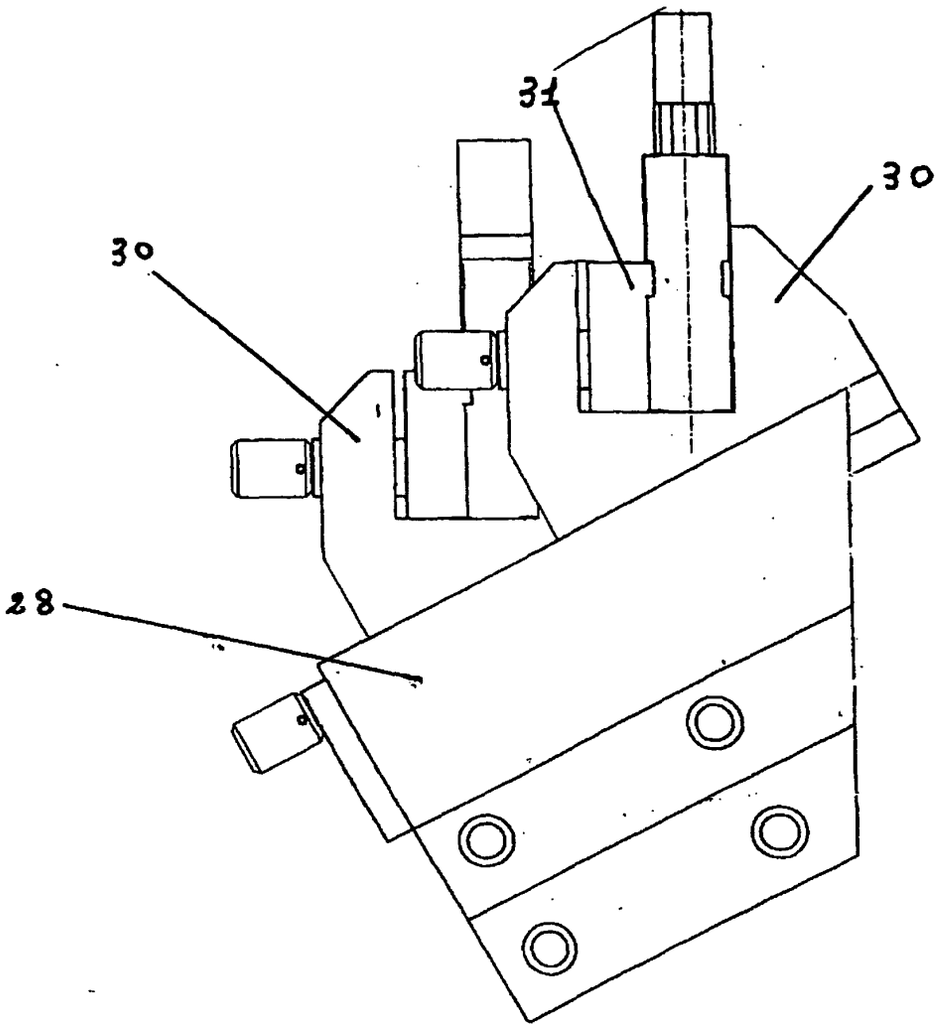


Fig 6(a)

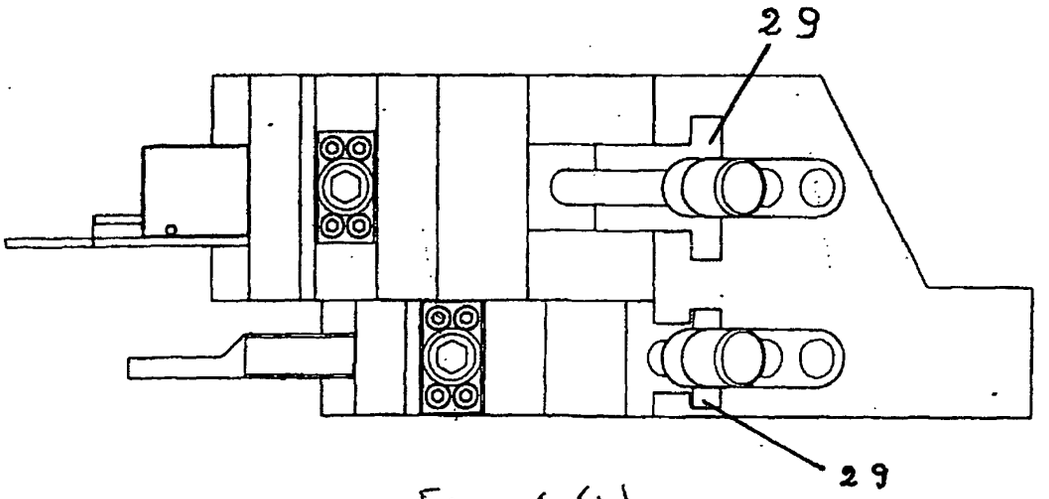


Fig. 6(b)

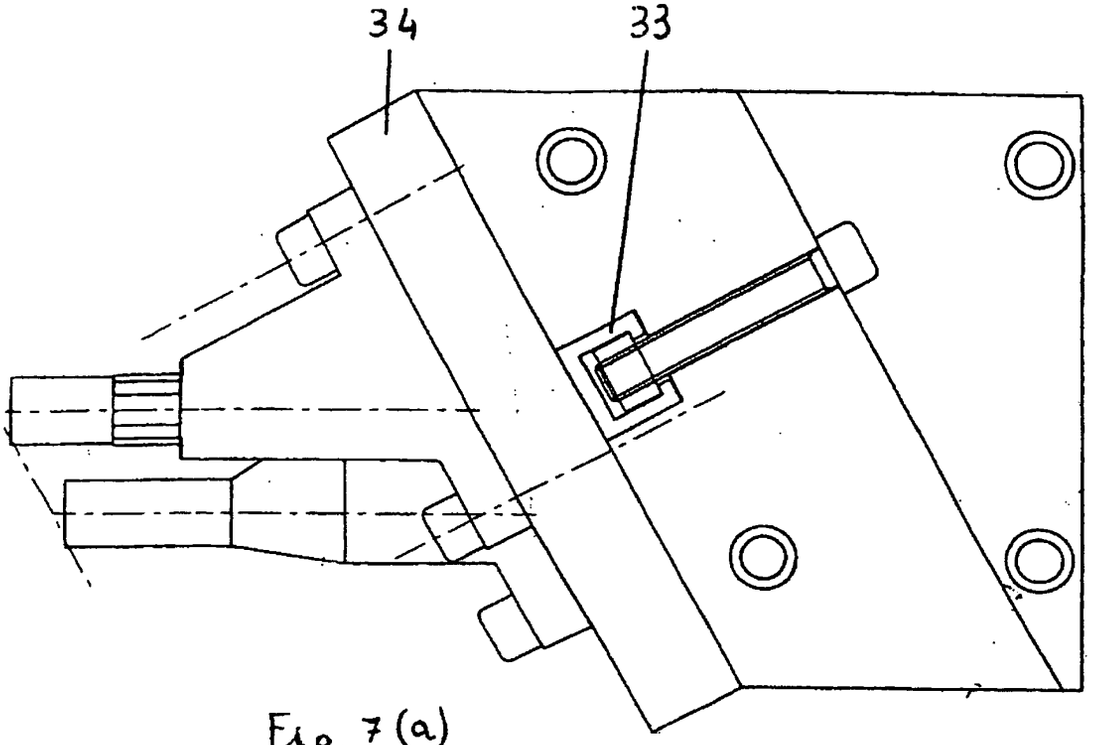
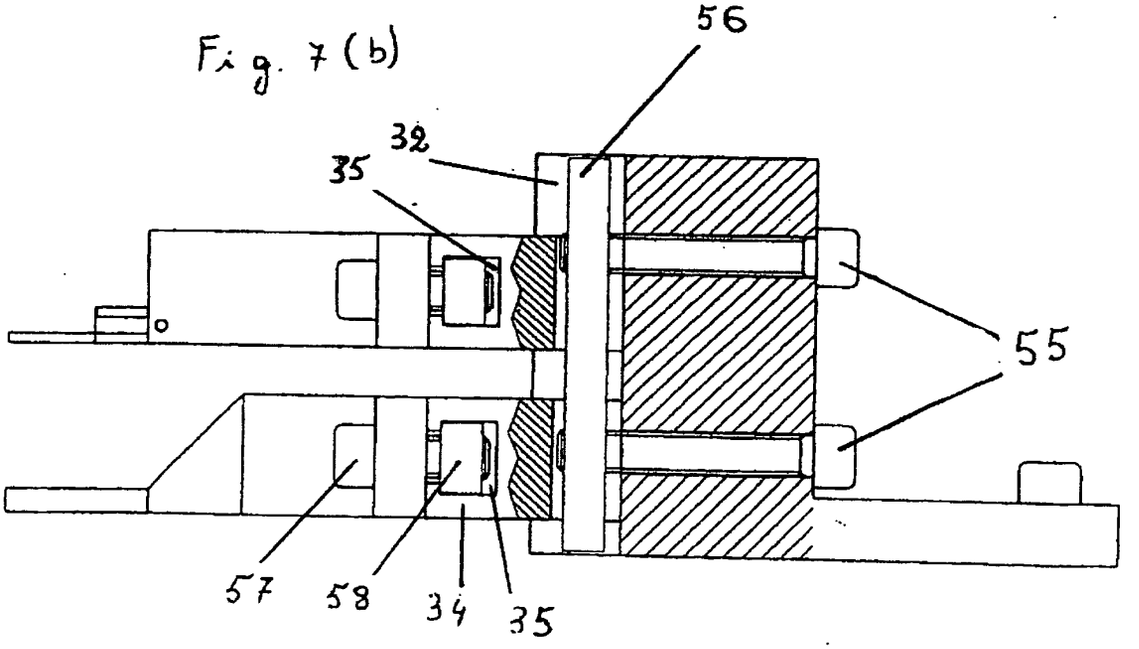


Fig. 7 (a)

Fig. 7 (b)



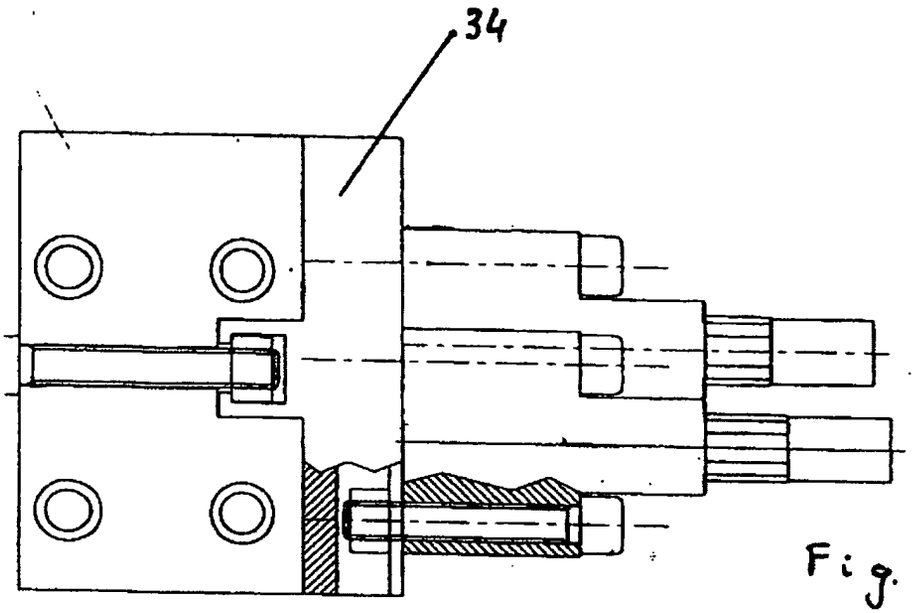


Fig. 8 (a)

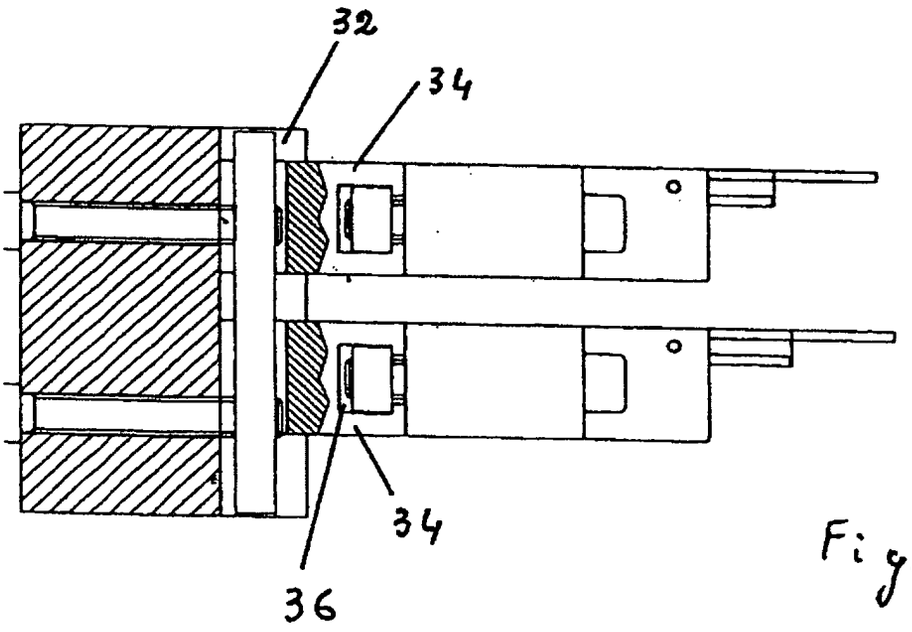
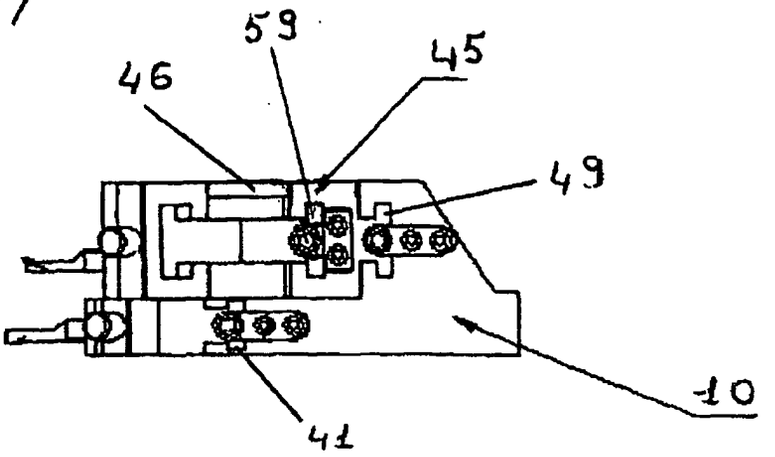


Fig. 8 (b)

Fig. 9 (b)



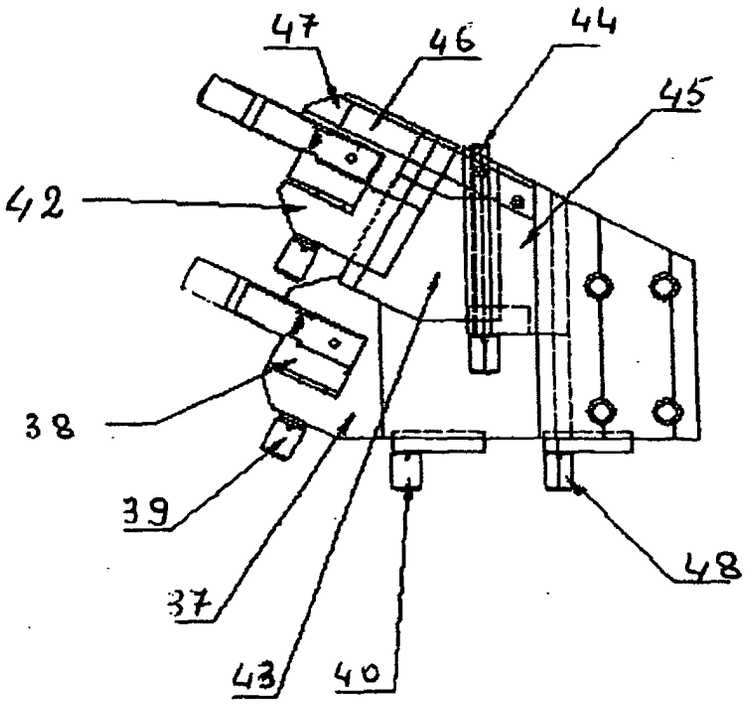


Fig. 9 (a)

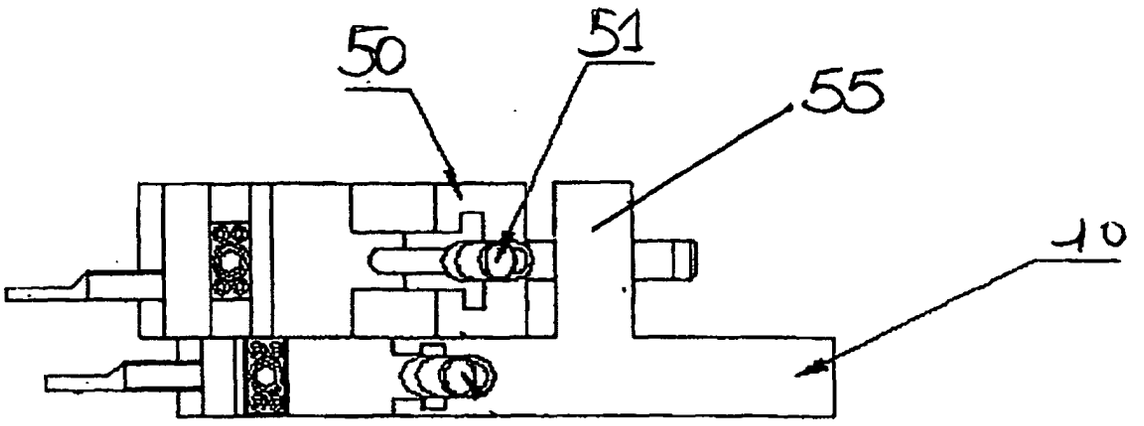


Fig. 10(b)

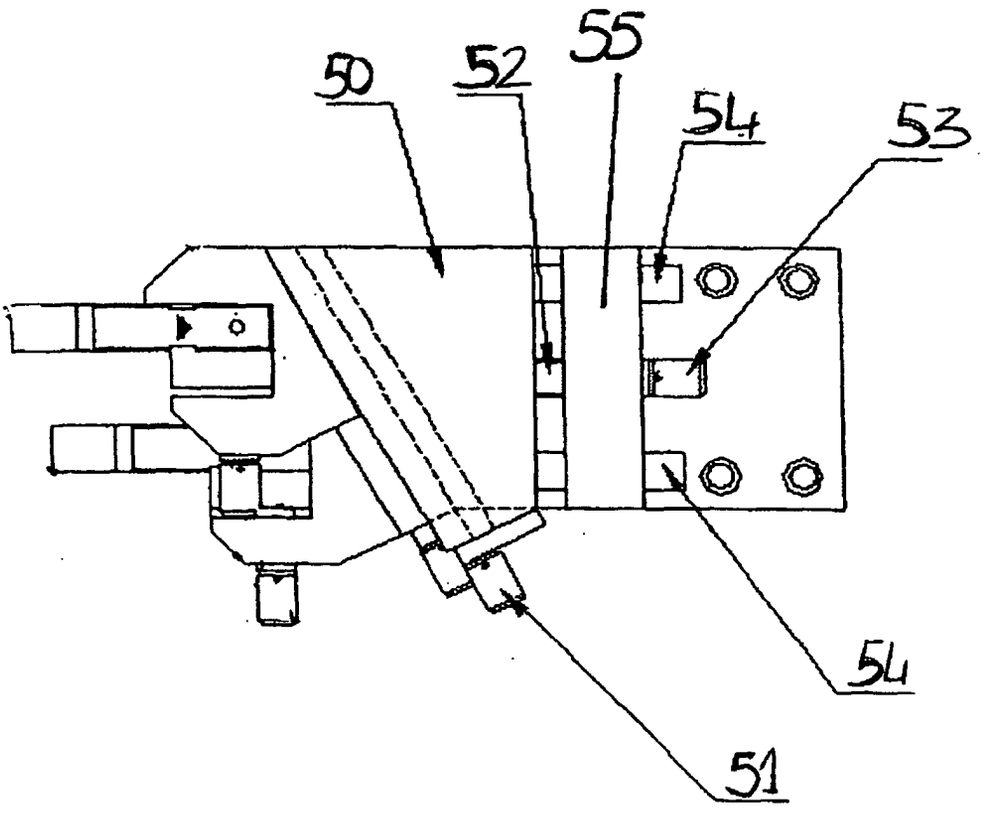


Fig 10 (a)

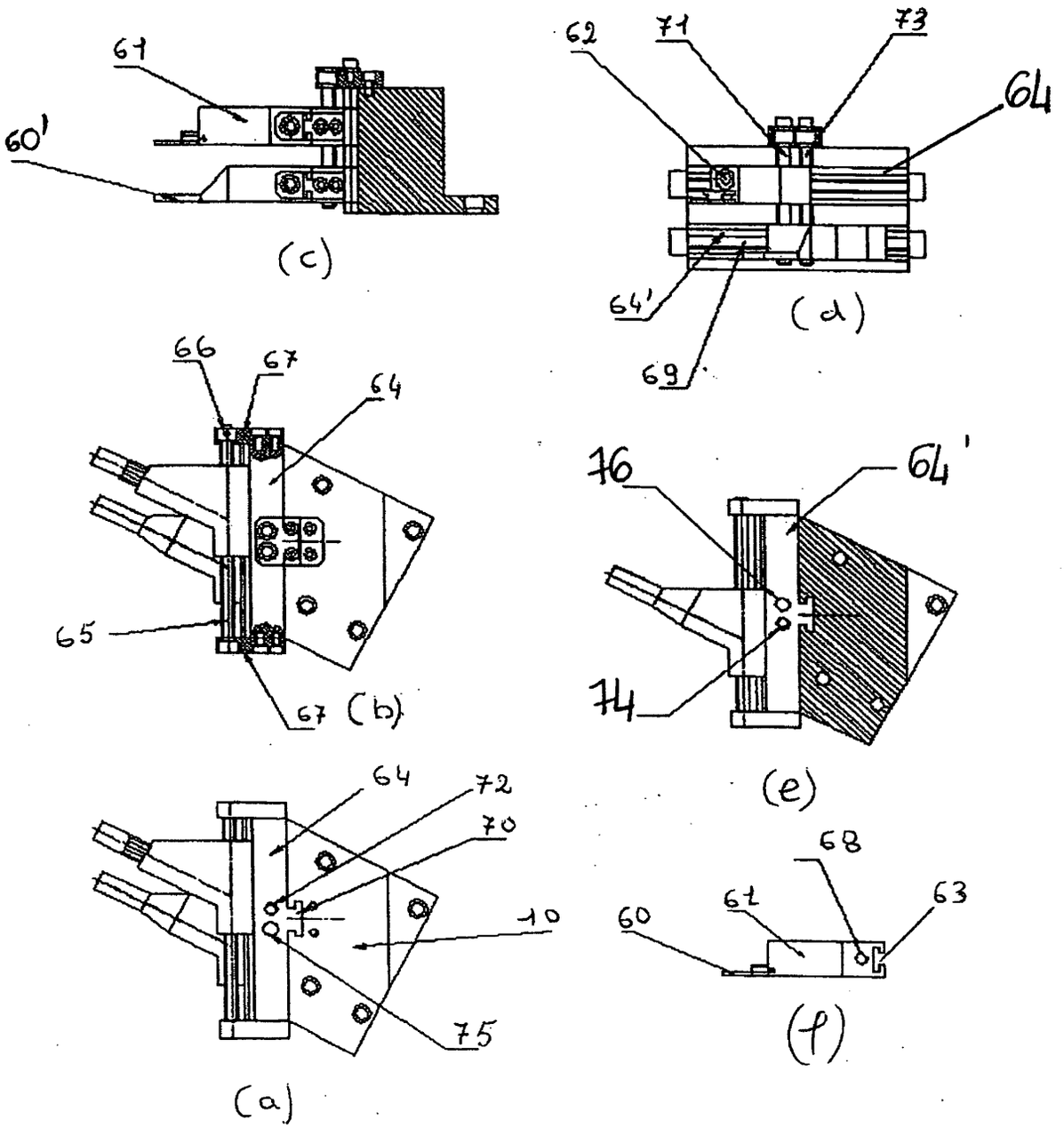

61
60'
(c)
62
71
73
64
64'
69
(d)
66
67
64
65
67
(b)
76
64'
74
(e)
64
72
70
10
75
(a)
68
61
63
60
(f)

Fig 11

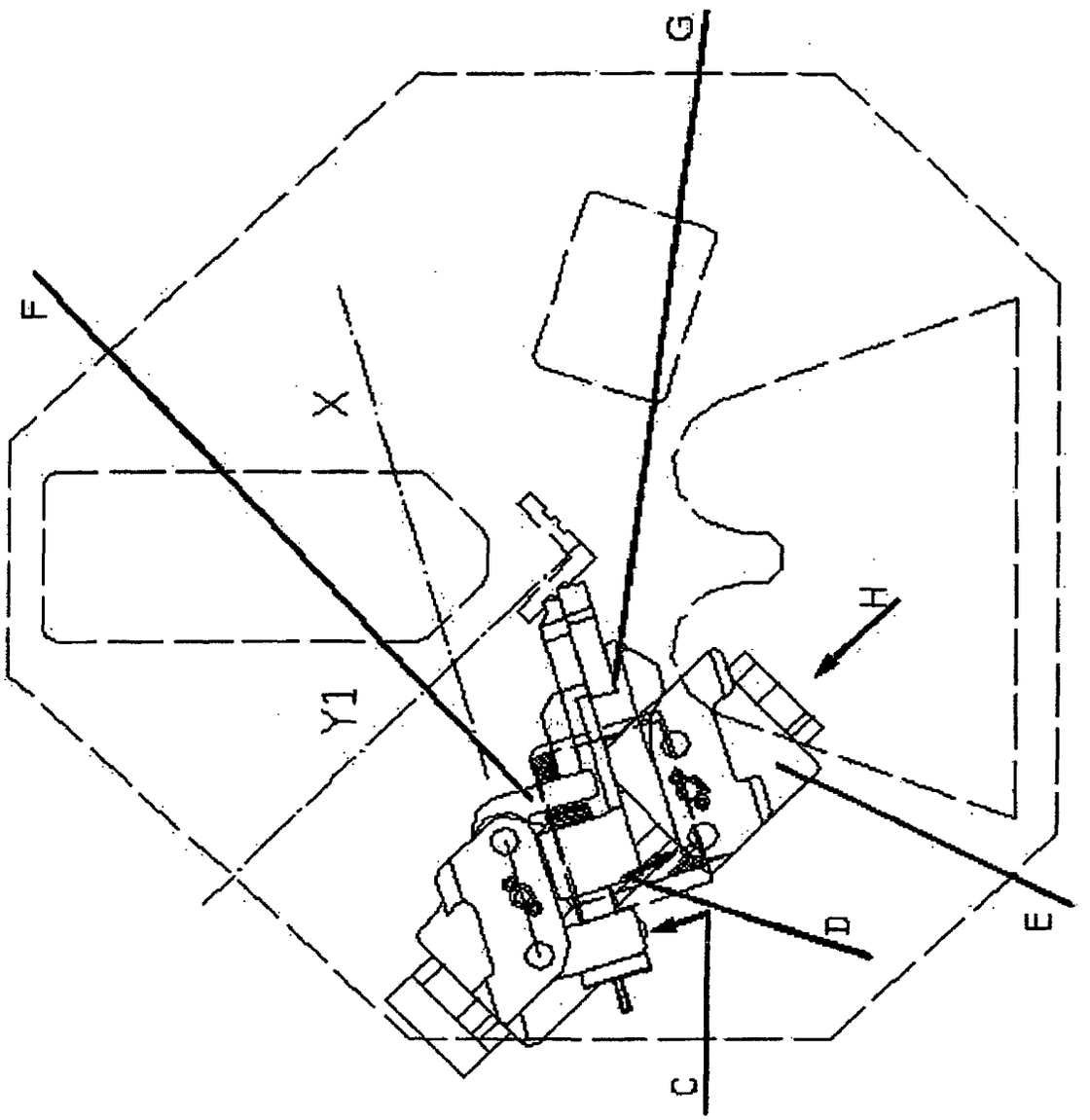


FIG. 12A

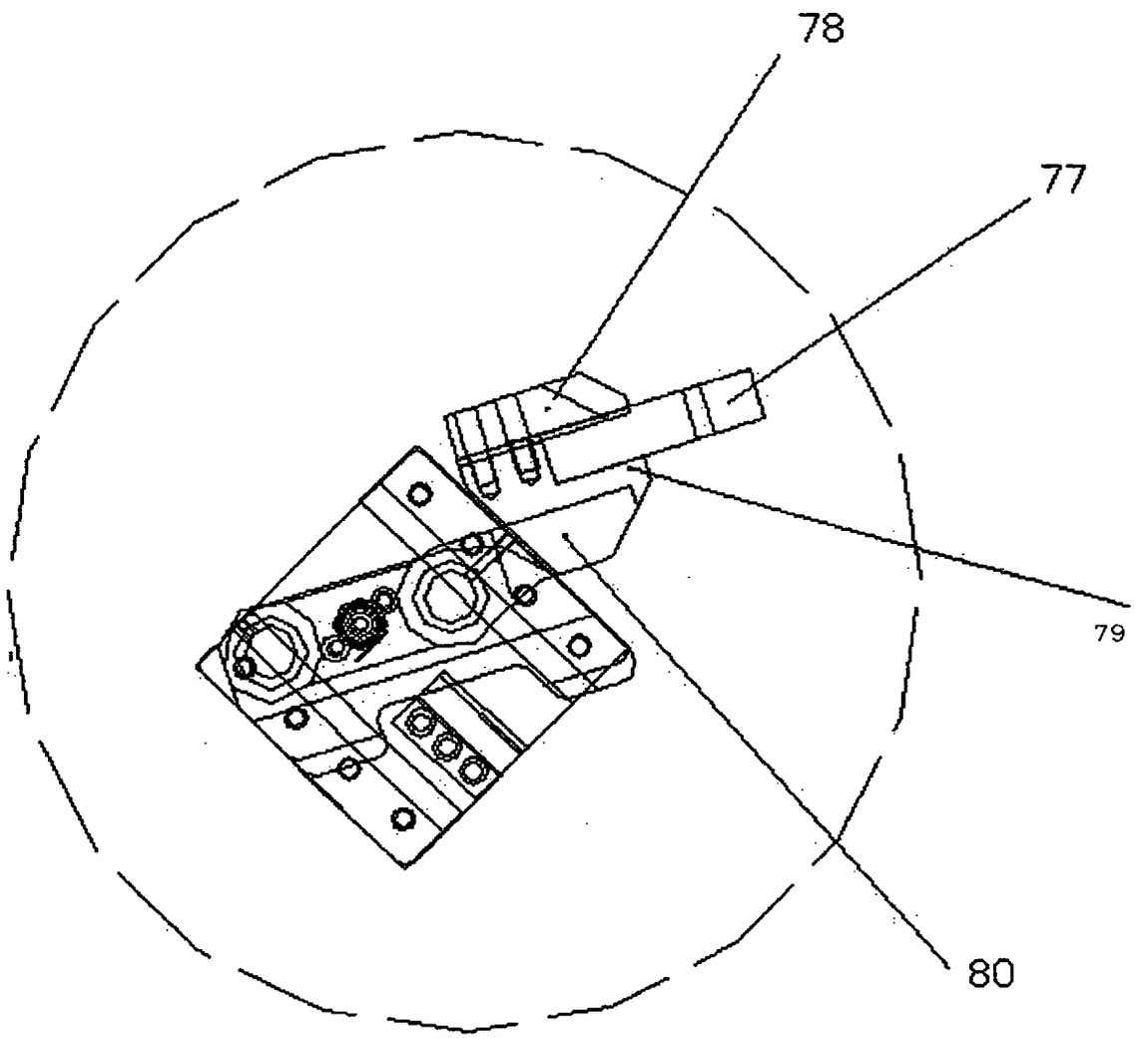


Fig. 12b

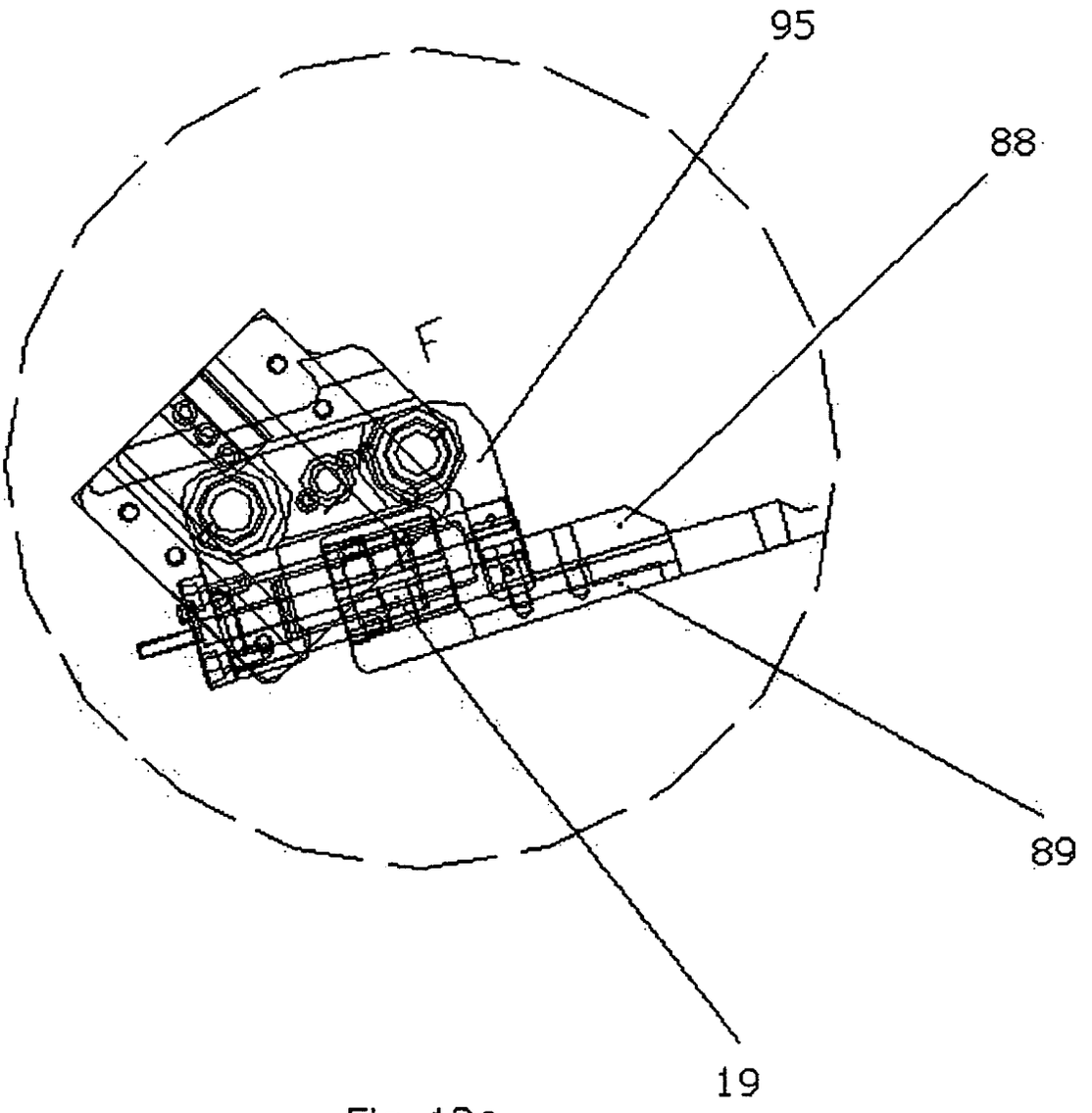


Fig. 12c

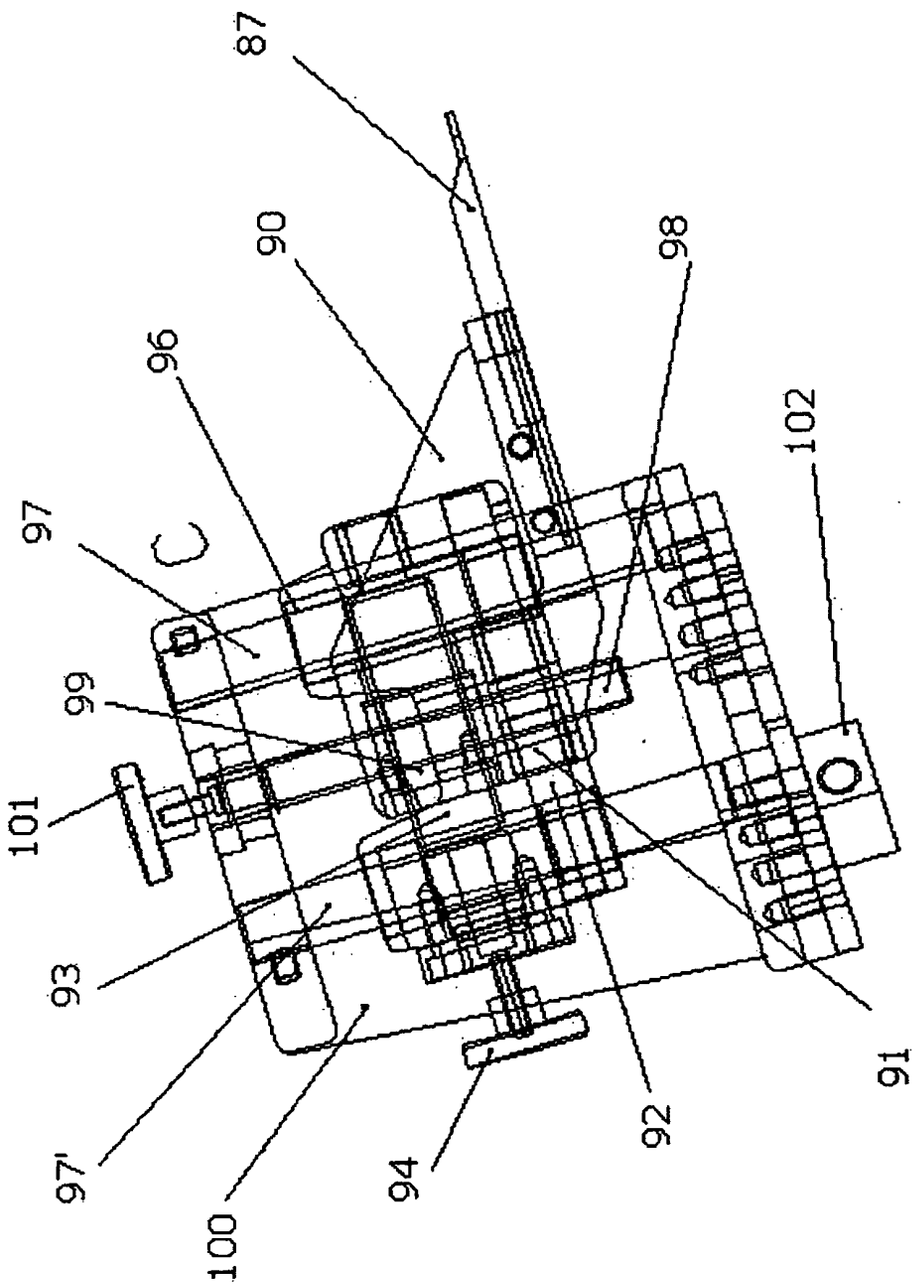


Fig. 12d

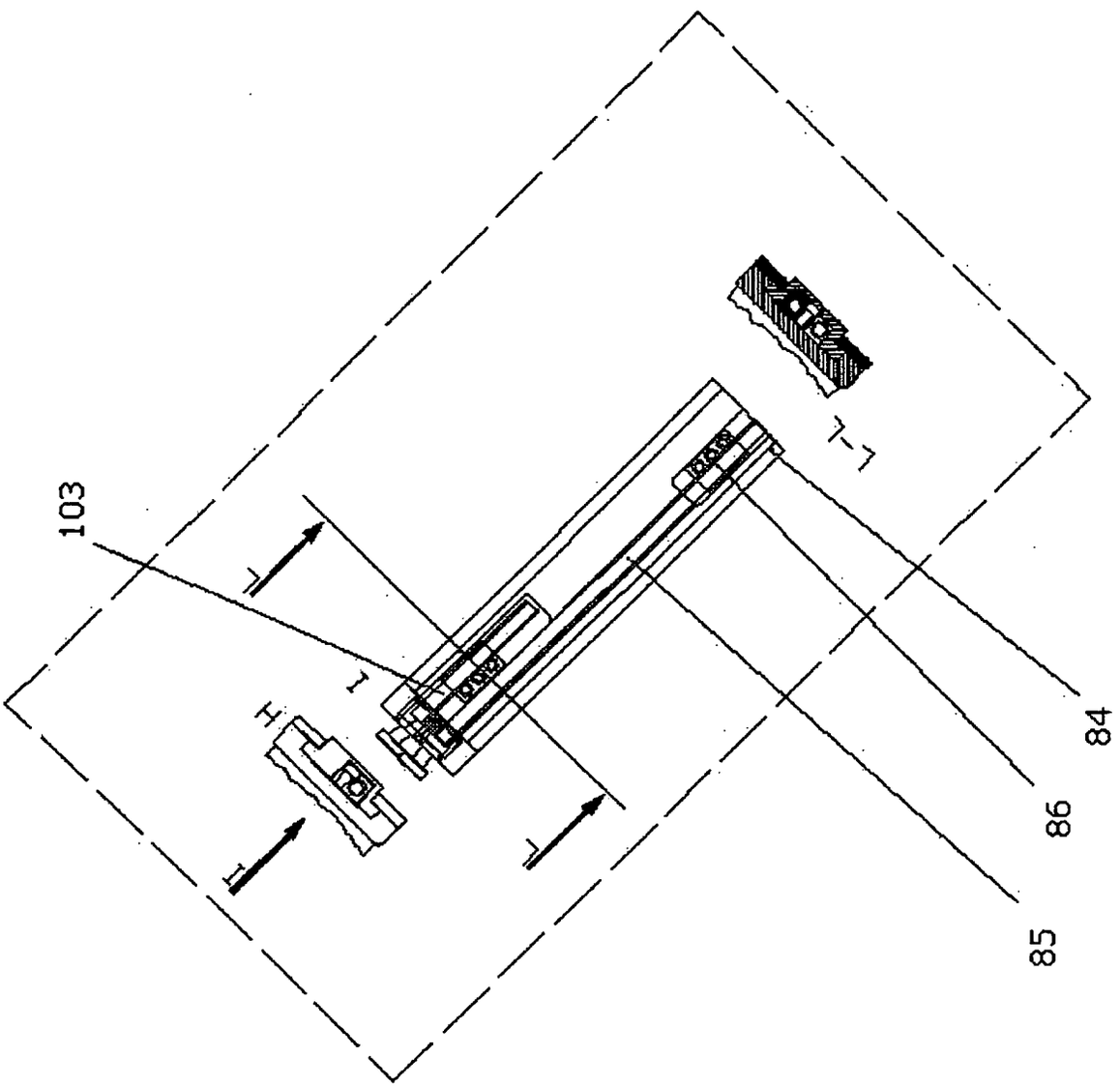


FIG. 12E

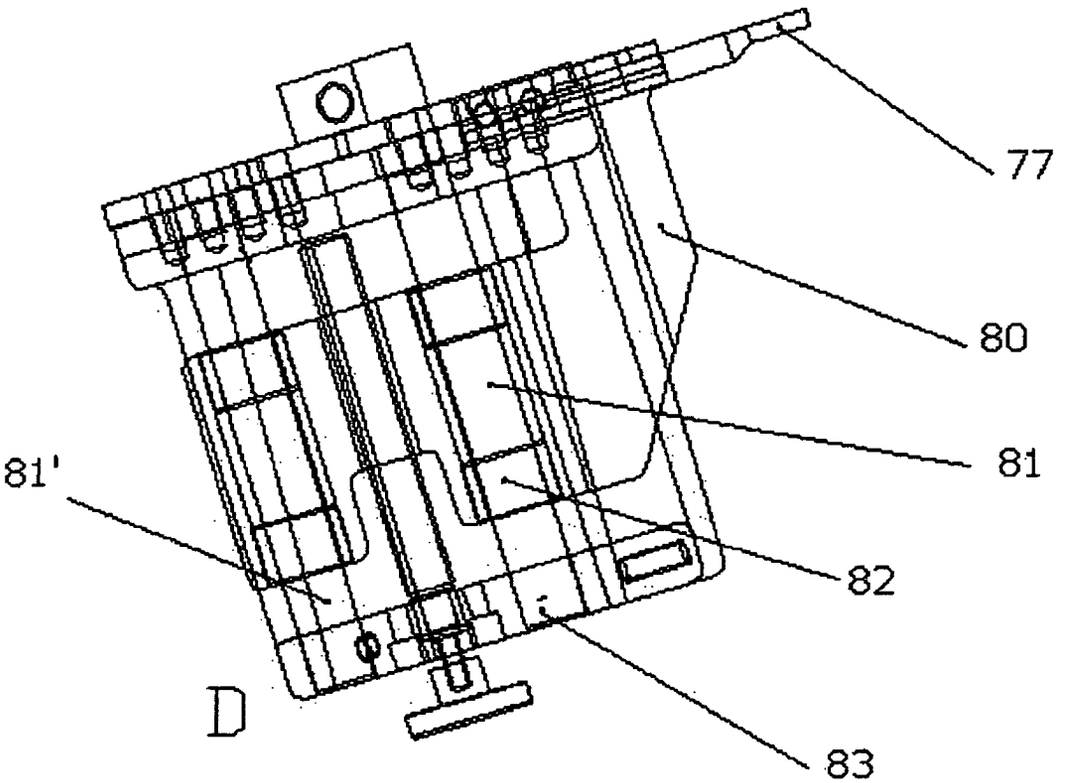


Fig. 12f

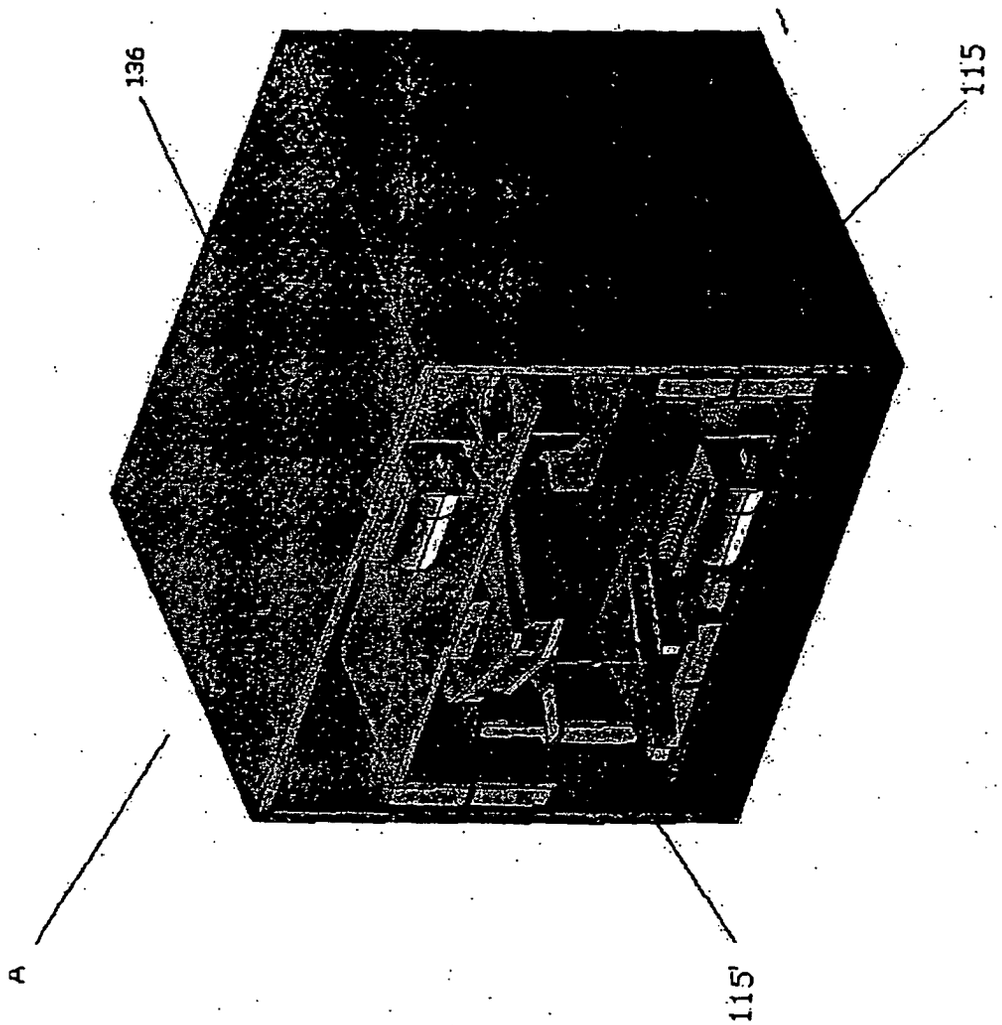


FIG. 13a

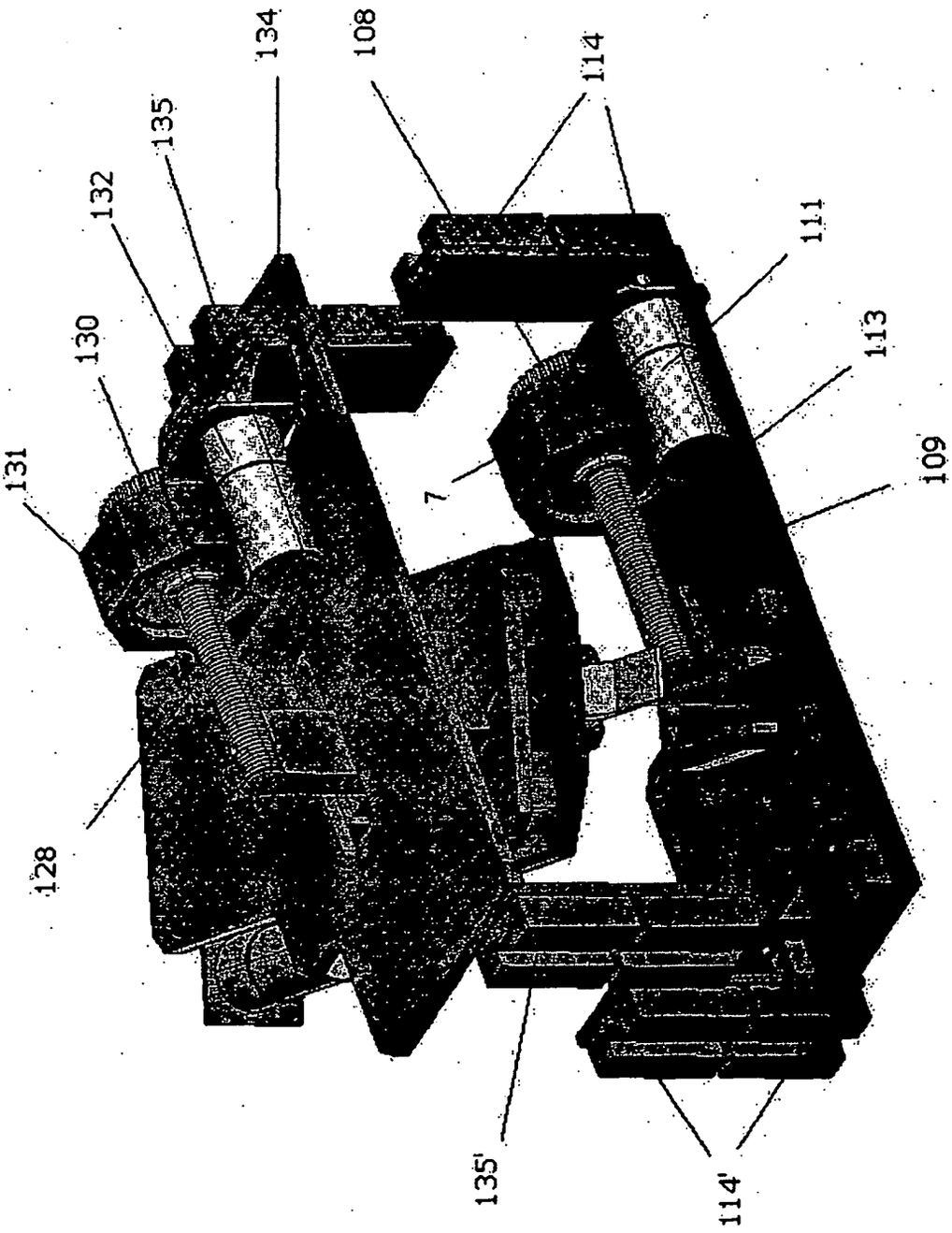
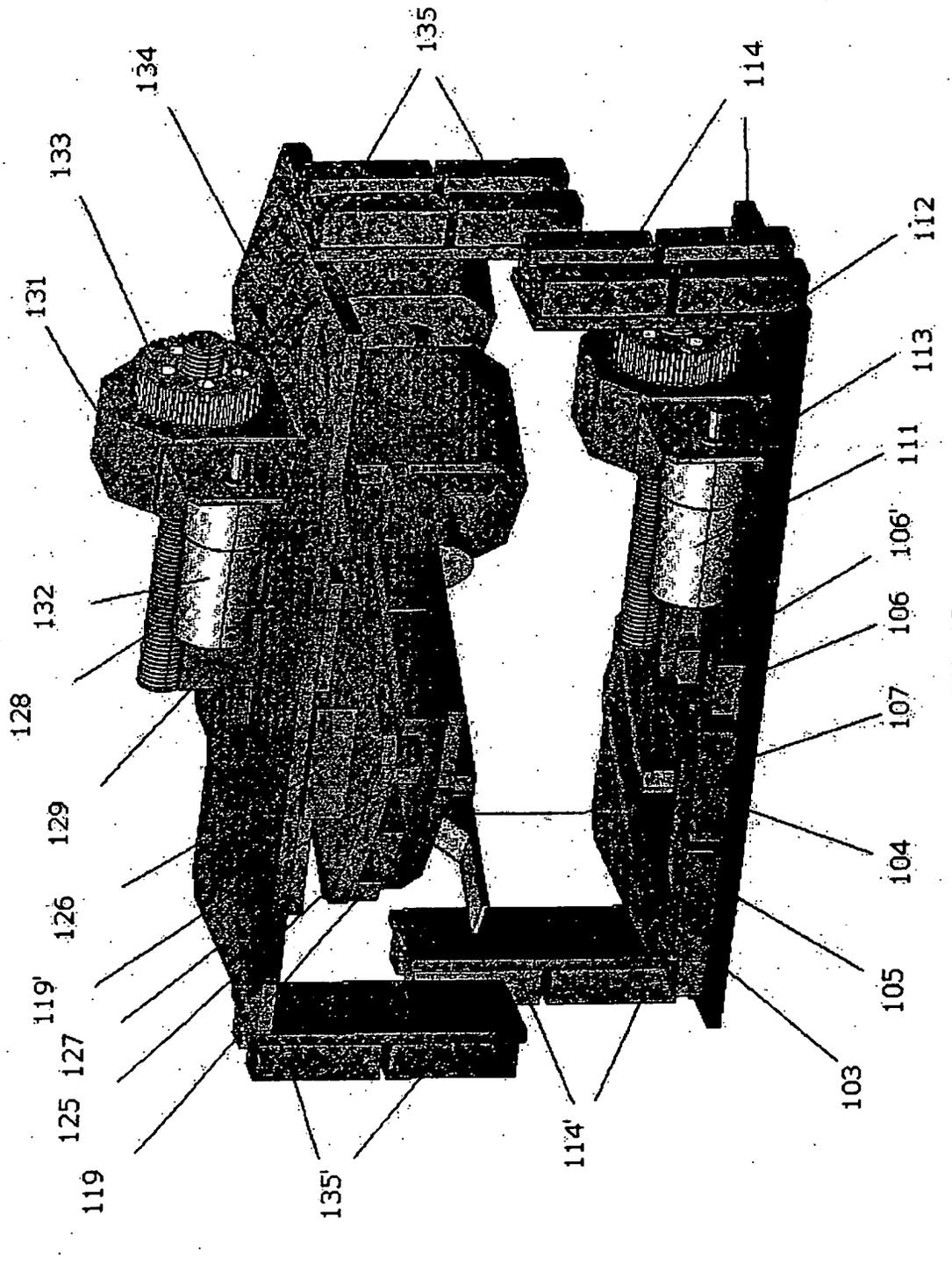


FIG. 13b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134
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114'
119
135'

FIG. 13c

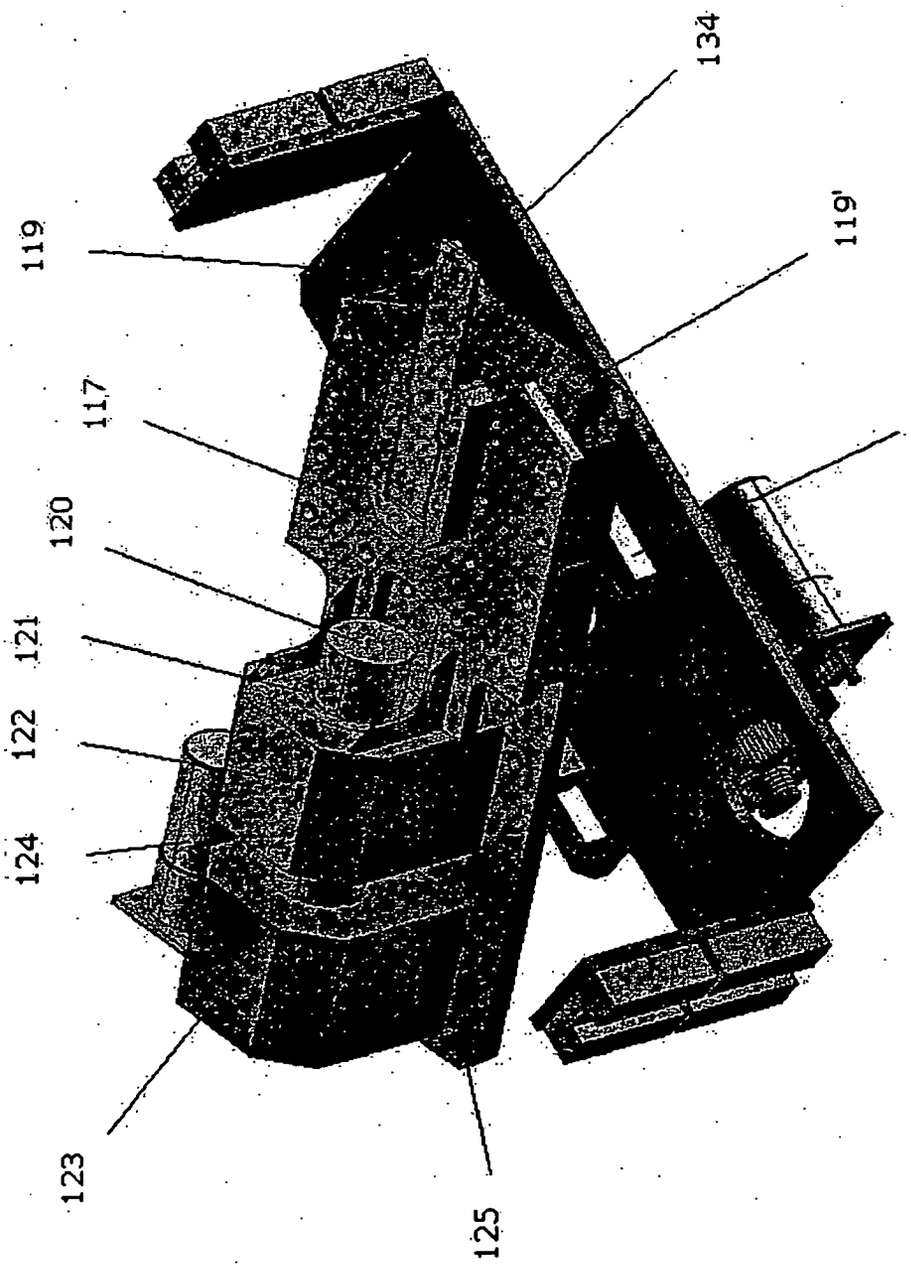
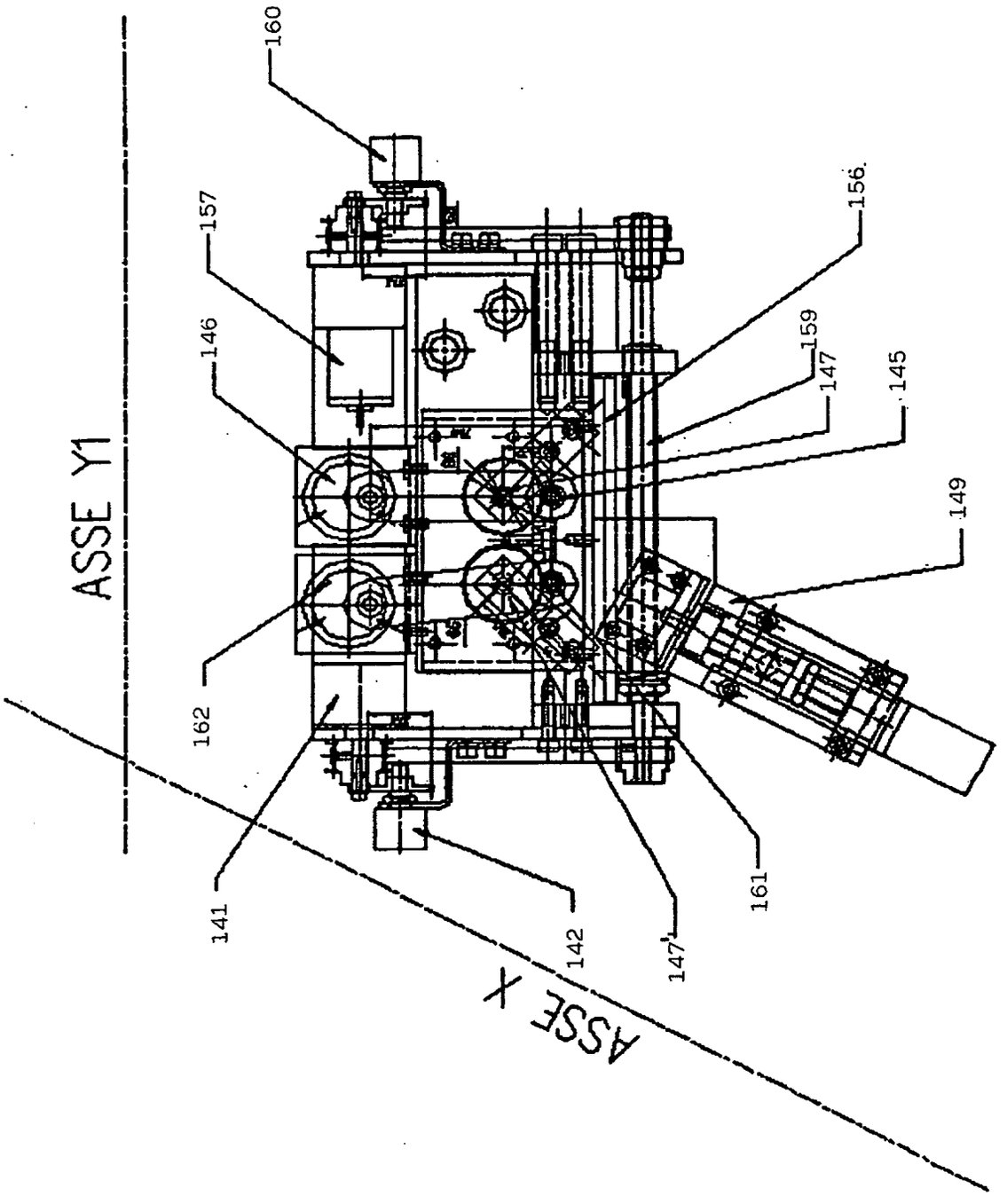


FIG. 13d


ASSE Y1
ASSE X
160
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146
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142
147'
161

FIG. 14A

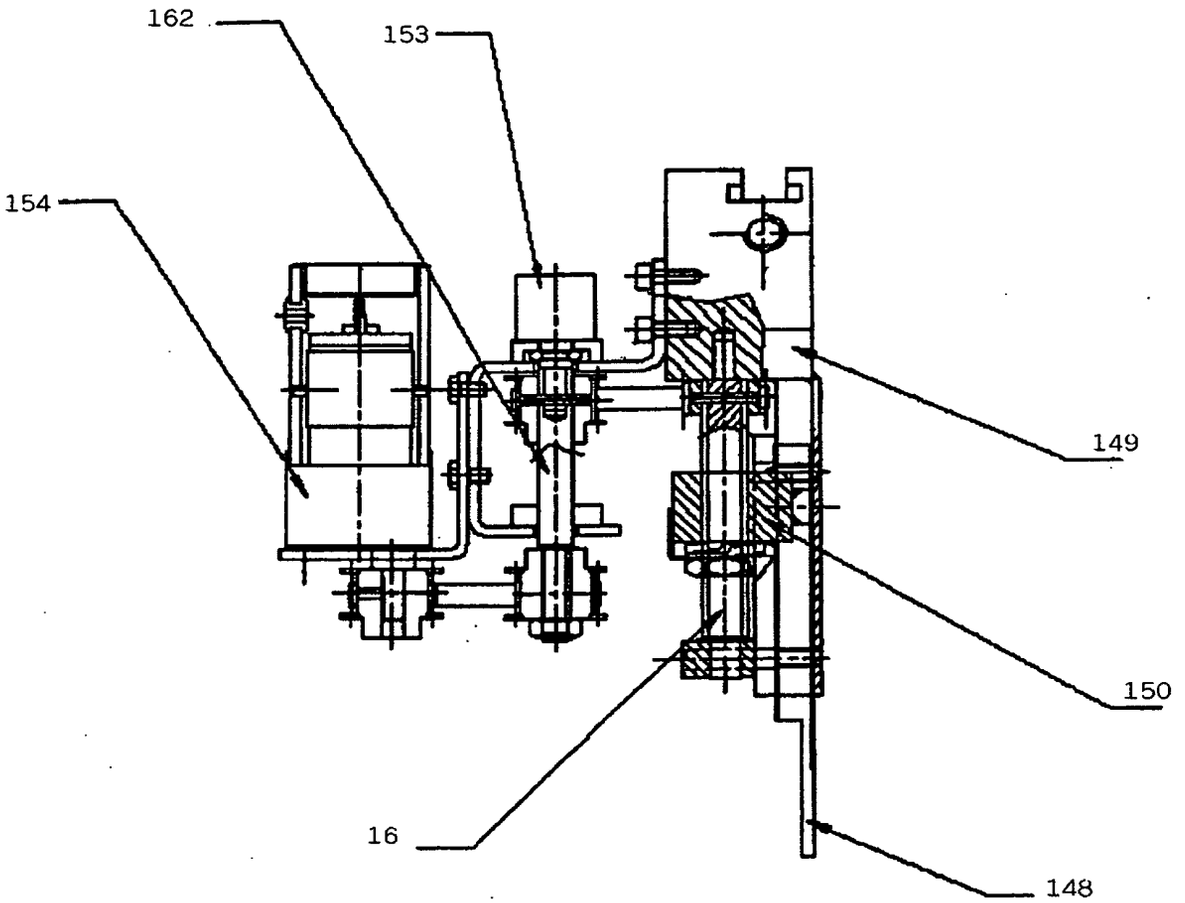
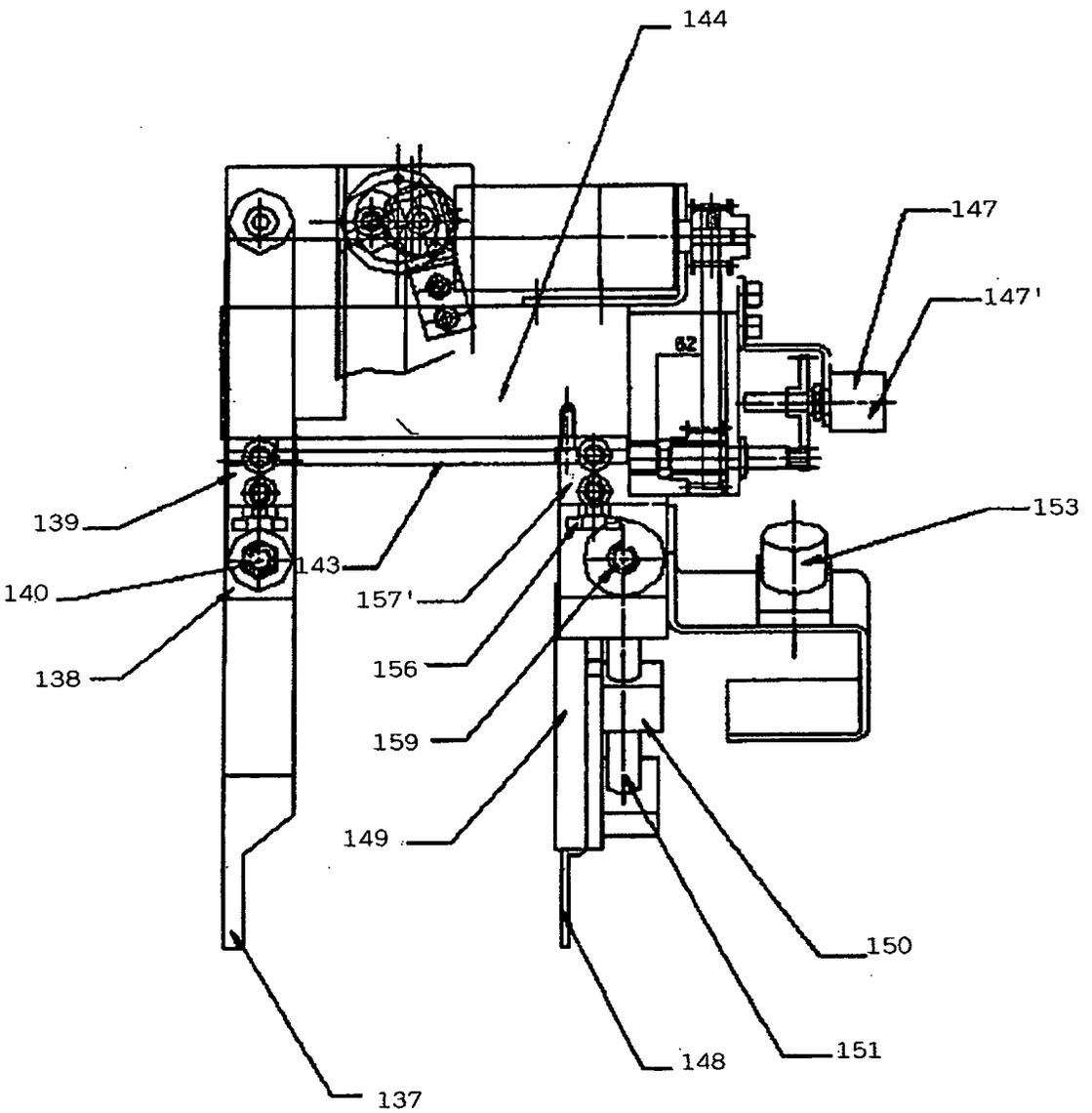


FIG. 14B


144
147
147'
82
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140
157'
153
138
156
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149
150
148
151
137

FIG. 14C

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 1119

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	* the whole document *	5-18	
X,D	EP 0 563 018 A (ATLA COOP SCARL) 29 September 1993 (1993-09-29)	1-4	
A	* column 3, lines 4-21 * * column 5, lines 33-37; figures 1,3 *	5-18	
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A	DE 84 03 382 U (PAUL ANTON GMBH) 12 April 1984 (1984-04-12) * page 12, lines 13-24; figure 1 *	1-18	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) B21D B23P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 June 2004	Meritano, L

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