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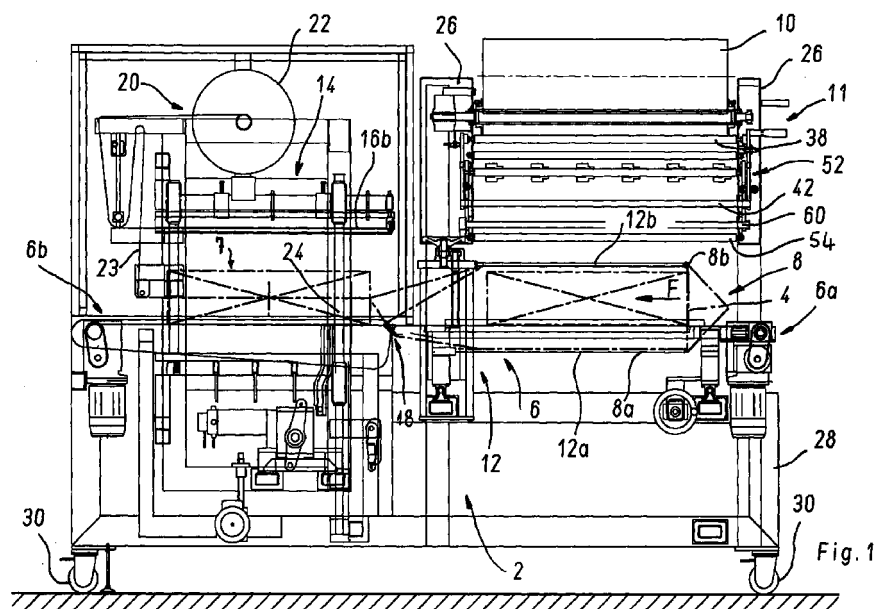
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(54) **Packaging system**

(57) An apparatus (2) in an aspect comprises feeding means (11, 12, 24) in order to feed sheet material (8) to a packaging station (7) of products (4), conveyor means (6, 6a, 6b) in order to convey said products (4) to said packaging station (7), bar means (16a, 16b) movable along an operating stroke and provided with active elements arranged in order to seal strips of said sheet

material (8) in said packaging station (7) so as to enclose said products (4) into said sheet material (8), said bar means (16a, 16b) being coupled to operating and driving means (134, 136, 148, 159, 160, 162) such to maintain said active elements mutually parallel at least during said operating stroke.



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## Description

**[0001]** The invention relates to method and apparatus for packaging objects.

**[0002]** The known packaging machines comprise a supporting frame to which sealing bars are coupled, through which a couple of strips of a thermosealable material film is passed between which a product to be packaged is enclosed.

**[0003]** Amongst the disadvantages of these known packaging machines it is to be shown the uncertainty of the operation of the sealing bars, that are pivotally connected like compasses at a side of the machine and therefore tighten the film strips with a higher pressure at the regions closer to the bar hinges and with a remarkable less high pressure at the regions more distant from said hinges.

**[0004]** Furthermore these machines are difficult to repair, because they have a rather complex structure.

**[0005]** In the known machines, where the sheet material is fed from a reel, it is moreover difficult to insert the sheet material through the different parts of the machine when the reel must be replaced.

**[0006]** A purpose of the invention is to improve the known systems for packaging products with sheet material.

**[0007]** In a first aspect of the invention, an apparatus is provided, comprising:

- feeding means for feeding sheet material to a product packaging station;
- conveyor means for conveying said products towards said packaging station;
- bar means movable along an operating stroke and provided with active elements arranged for sealing strips of said sheet material in said packaging station so as to enclose said products in said sheet material, characterized in that, said bar means is coupled to operating and driving means capable of keeping said active elements mutually parallel to each other at least during said operating stroke.

**[0008]** In this way the sealing of the sheet material takes place in optimal conditions, which causes a remarkable improvement of the quality of the package.

**[0009]** In a second aspect of the invention, an apparatus is provided comprising:

- feeding means for feeding sheet material to a product packaging station;
- conveyor means for conveying said products towards said packaging station;
- bar means movable along an operating stroke and provided with active elements arranged for sealing strips of said sheet material in said packaging sta-

tion so as to enclose said products in said sheet material, characterized in that, said apparatus comprises at least a group selected from:

- sheet material unwinding group;
- conveyor group for the products to be packaged in order to direct them towards said packaging station;
- conveyor group for the packaged products in order to extract them from said packaging station;
- sheet material dragging group in order to feed it to the packaging station;
- rewinding group of scraps of said sheet material; and that said at least one group is supported to frame means in a modular manner.

**[0010]** That simplifies remarkably the maintenance and/or repair operations of the packaging machine.

**[0011]** In a third aspect of the invention, an apparatus is provided comprising:

- feeding means for feeding sheet material to a product packaging station;
- conveyor means for conveying said products to said packaging station;
- bar means movable along an operating stroke and provided with active means arranged for sealing strips of said sheet material along a sealing plane in said packaging station so as to enclose said products in said sheet material, characterized in that, means is provided in said packaging station for adjusting the height of said sealing plane.

**[0012]** That makes possible to adapt the packaging machine to different formats of products in a particularly easy manner.

**[0013]** In a fourth aspect of the invention, an apparatus is provided comprising an unwinding group (32, 36, 38, 39, 52, 54) for unwinding sheet material (8), comprising support means for a reel of said material, roller means for driving said sheet material while it is unwound from said reel, characterized in that, said roller means comprises a floating roller which moves along a curved path and may be blocked in a disengagement position in which it does not interfere with said sheet material coming down from said reel.

**[0014]** That allows to perform the change of the reel in a particularly easy manner.

**[0015]** The invention will be better understood and carried out with reference to the following drawings, that illustrate, for merely exemplifying purpose, an embodiment of the invention, in which :

Figure 1 is a side view of the apparatus according to the invention;

Figure 2 is a plan view of the apparatus of Figure 1;

Figure 3 is a right view of Figure 1;

Figure 4 is a view of an unwinding unit of the film material;

Figure 5 is a plan view of the unwinding unit of Figure 4;

Figure 6 is a plan view of a deflecting unit of the sheet material for product packaging associated with a portion of a moving unit of the products to be packaged;

Figure 7 is a side view of the deflecting unit of Figure 9;

Figure 8 is the section VIII-VIII of Figure 6;

Figure 9 is the section IX-IX of Figure 6;

Figure 10 is a plan, broken view of a moving unit of the products to be packaged;

Figure 11 is a side view of the moving unit of Figure 10;

Figure 12 is a plan view of the sealing unit of the sheet material for packaging the products;

Figure 13 is a right view of the sealing unit of Figure 12;

Figure 14 is a right side view of the sealing unit of Figure 13;

Figure 15 is a side view of a rewinding unit of the scraps of sheet material;

Figure 16 is a side view of a dragging unit of the sheet material;

Figure 17 is the right, partially sectioned, view of the dragging unit of Figure 16.

**[0016]** As shown in Figures 1 to 3, in a packaging apparatus denoted on the whole as 2, products 4 to be packaged are arranged on a moving unit 6 comprising a first conveyor 6a and a second conveyor 6b, arranged one next the other, the latter holding a packaging station 7.

**[0017]** The packaging sheet material 8 is unwound from a reel 10 supported by an unwinding unit 11 while the product 4 is progressively advanced from the first conveyor 6a to the second conveyor 6b along the direction of the arrow F. The sheet material 8 is constituted by a single sheet, longitudinally folded at its centre-line so as strips 8a, 8b of the sheet material 8 are arranged respectively above and below the first conveyor 6a as a result of the action of deflecting rods, indicated respectively as 12a, 12b, being part of a deflecting unit 12 of the strips of the sheet material. The deflecting unit 12, as it will be more in detail described later on, is so arranged as to keep freely accessible from the outside the end of the first conveyor 6a far away from the second conveyor 6b, in order to allow the product 4 to enter through said unit along the advancing direction F.

**[0018]** After passing from the first conveyor 6a to the second conveyor 6b, the product 4 is enclosed between the strips 8a, 8b and packaged between them by means of a sealing unit 14 the sealing bars of which, respectively a lower bar 16a and an upper bar 16b, tighten between themselves the strips 8a, 8b, joining the strips to each other through the combined action of heat and pressure.

**[0019]** The clearance 18 has such dimensions as to

allow the lower sealing bar 16a to pass through it for tightening the strips 8a, 8b during the sealing.

**[0020]** For this purpose, the lower strip 8a is caused to pass, from the position below the first conveyor 6a where it initially lies, to a defined position between the product 4 and the second conveyor 6b passing through a clearance 18 between the first conveyor 6a and the second conveyor 6b.

**[0021]** After being wrapped by the strips 8a, 8b and enclosed between them permanently, the product is caused to exit passing through the end of the second conveyor 6b more distant from the first conveyor 6a and is forwarded to a heating unit (not shown) that activates properties of thermo-retraction of the sheet material 8 causing it to adhere to the product 4.

**[0022]** Above the second conveyor 6b a scrap rewinding unit 20 is supported, that withdraws from the working region near the sealing unit 14 the unused portions of the sheet material 8, having the form of a tape 23 and collects them on a spool 22, that is periodically replaced.

**[0023]** The sheet material 8 is advanced from the first conveyor belt 6a to the second conveyor belt 6b by a dragging unit 24 that, in addition, joins together the edge regions of the strips 8a, 8b opposed to the fold that links them, when the product 4 and the strips 8a, 8b are near to be subjected to the sealing action of the sealing bars 16a, 16b.

**[0024]** The unwinding unit 11, the deflecting unit 12, the moving unit 6, the dragging unit 24, the dealing unit 14 and the scrap winding unit 20 are supported to a main frame body 28 movable on wheels 30.

**[0025]** As shown in Figures 3 and 4, the unwinding unit of the sheet material 8 comprises a pair of side walls 26 so spaced as to axially receive the reel 10 abutting on a pair of positioning rollers 32 rotatably supported to the side walls 26 and interconnected by a belt transmission 34 and driven by a respective motor reducer group 36.

**[0026]** The sheet material 8 is unwound from the reel 10, whilst the reel is driven by the motor reducer group 36, and is engaged by a floating roller 38 supported so as to be free to rotate to the ends of a couple of oscillating arms 40 hinged on the side walls 26 at a common axis 42.

**[0027]** The floating roller 38 runs along arched paths moving in a pair of slots 44 of the side walls 26 so as to keep the sheet material 8 at a pre-established tension under the action of a return spring 46 interposed between at least one of the arms 40 and a slider 48 coupled to the respective side wall 26 in such a way as to be adjustable by means of a screw 50 that can be actuated by a knob 50.

**[0028]** A couple of piercing rollers 52 prearranges the material 8, that after leaving the floating roller 38 gets in contact with a first return roller 39, to the entry position for the underlying deflecting unit 12 after the action of a second return roller 54, this also supported

so as to be free to rotate to the side walls 26. One of the piercing rollers 52 is provided with suitable means in order to pierce the sheet material 4 so as to allow the air to exit when the product 4, packaged between the strips 8a, 8b, is introduced into the heating means in order to activate retraction properties thereof.

**[0029]** One of the piercing rollers 52 is supported so as to be free to rotate to the pair of side walls 26; the other piercing roller 52, movable into a further slot 62 of the side walls 26, is rotatably supported to a couple of further oscillating arms 56, hinged to a further common axis 60; at least one of the further oscillating arms 56 is coupled to a spring 58 in order to keep the piercing rollers 52 mutually pressed one against the other.

**[0030]** A handle 64 is fixed at one end of the floating roller 38 on the arm 40 for the manually operating the floating roller 38 when a reel 10 must be replaced. For this purpose, actually, an operator acting onto the handle 64 can bring the floating roller 38 up to the end 45 of the slot 44 wherein the floating roller is no more acting on the sheet material 8, can leave the sheet material 8 to come down through the return rollers 39, 54, can engage it into the deflecting unit 12 as later described and then can release the floating roller 38 that is withdrawn by the spring 46 towards the end of the slot 44 opposed to the end 45, so tensioning the sheet material 8.

**[0031]** A first sensor 66 and a second sensor 68 are arranged along the length of the slot 44, the latter being closer to the end 45. When the floating roller, under the action of the spring 46, goes beyond the first sensor 66, the sensor 66 sends to the motor reducer 36 an operating control signal for stopping the unwinding of the reel 10; when the floating roller 38 goes beyond the second sensor 68, the sensor 68 sends a signal for starting the motor reducer 36 and unwinding further sheet material 8 from the reel 10.

**[0032]** As shown in the Figures from 6 to 9, the deflecting unit 12 is associated to one end of the first conveyor 6a through a connecting frame 68, having a C-shaped structure, as better visible in Figure 8. The connecting frame 68 comprises an upper arm 70, movable in height through a handwheel 74, supported by a free-to-rotate shaft 72 coupled to the upper arm 70 in order to operate, through the belt 73, a vertical actuating screw 76 placed at a side of the belt 6a and engaged into a female screw 78. The female screw 78 is inserted into a lower body 80 mounted at one end of a first lower arm 82 to the opposed end of which a bracket 84 is coupled to which the body 75 of the first conveyor 6a is fixed onto which is slidably engaged a belt 79 of the conveyor 6a. To the end, of the body 75 opposed to the bracket 84 a driving board 87 for driving the products 4 onto the belt 79 is fixed.

**[0033]** At opposed sides of the screw 76 driving columns 77 are arranged, engaged into bushings (not shown) of the lower body 40, in order to ensure, during the vertical movements, that the upper arm 70 is kept

parallel to itself.

**[0034]** The upper deflecting rod 12b is secured to the upper arm 70, having a substantially V-shaped form in plan view, constituting a triangle with the upper arm 70. The deflecting lower rod 12a is secured between the lower body 80 and the bracket 84, having a shape in plan view substantially equivalent to shape in plan view of the upper deflecting rod 12b.

**[0035]** In order to allow the first conveyor 6a with the deflecting unit 12 to be transversally positioned, that is according to a direction perpendicular to the direction F, the first lower arm 82 and a second lower arm 90 supporting the opposed end of the first conveyor 6a are respectively mounted on a couple of driving bushings 86 of a couple of cross-members 88, extending perpendicularly to the direction F.

**[0036]** The end of the belt 79 relevant to the deflecting unit 12 is wound around a free-to-rotate roller 92 whereas the opposed end is wound on a roller 94 motorized by a motor reducer 96 and a belt transmission 98. The motorized roller 94 is supported to a upright 91 connected to the second lower arm 90.

**[0037]** The second lower arm 90 is furthermore engaged by an actuating block 100, coupled to an actuating screw 102 that can be operated by a respective handwheel 104, supported to the frame 28 through bushing 106. By rotating the handwheel 104, the first conveyor 6a and the deflecting unit 12 can be moved transversally to the direction F, while sliding onto the couple of slides 88.

**[0038]** As shown in the Figures 10 and 11, the second conveyor 6b of the moving unit 6 is provided with side walls 108 and, at the end more distant from the first conveyor 6a, with a roller 110 motorized by a motor reducer 112 and a belt transmission 114. A belt 116 is wound around this end, having the other end engaged by a lower roller 118 free to rotate around a fix axis, a first return roller 120 and a second return roller 122, both supported free to rotate to a trolley 124 that can be moved, through a cam 126, away or closer to the corresponding end of the first conveyor 6a.

**[0039]** The cam 126 is also connected to the trolley 124 and can be operated through a pin 128 connected to the lower sealing bar 16a, so as, when the lower sealing bar is lifted in order to interact with the upper sealing bar 16b, the trolley 124 moves away from the first conveyor 6a allowing the lower sealing bar to pass through the clearance 18, whereas, when the lower sealing bar 16a is lowered, the trolley approaches the first conveyor 6a and aids the passage of the products 4 from the first conveyor 6a to the second conveyor 6b. The trolley 124 is provided with horizontal slides 130 slidably engaged on a support 132.

**[0040]** As shown in the Figures from 12 to 14, the sealing unit 14 comprises an external frame body 134 slidably supported onto two couples of external vertical slides 136 through bushings 138 and vertically movable with respect to them through a motor reducer 140 and a

driving screw 142 that engages a female screw 144 secured to a base cross-beam 146 of the external frame 134.

**[0041]** The external frame 134 is internally provided with two couples of internal vertical slides 148 to which an upper window frame 150 and a lower window frame 152 are slidably coupled. The upper sealing blade 16b, having a L-shape in plan view is connected to the lower side of the upper window frame 150, and the lower sealing blade 16a, that shows substantially the same shape in plan view of the upper sealing blade 16b, is connected to the upper side of the lower window frame 152 through elastic means 154.

**[0042]** The upper frame 150 has opposed sides connected through a first couple of connecting rods 159 to corresponding ends of a couple of cranks 156, mounted at the ends of a shaft 158, coupled to a motor reducer 160, suitable to perform rotations of about 180° in a direction of rotation and in the opposite direction.

**[0043]** The cranks 156 have other ends, opposed to the ends engaged by the first connecting rods 159, to which second connecting rods 162 are coupled, that are connected to the lower window frame 152.

**[0044]** The disposition of the connecting rods 159, 162 is such that, when the cranks 156 perform a rotation of about 180° in a direction, the sealing bars 16a, 16b progressively approach to each other tightening between them the strips of the sheet material 8 and, when the cranks perform a rotation of 180° in an opposite direction, the sealing bars 16a, 16b move away from each other.

**[0045]** The arrangement of the above described parts is such that both the closing movement and the opening movement of the sealing bars 16a, 16b is carried out keeping the bars mutually parallel to each other.

**[0046]** As shown in Figure 15, in the scrap winding unit 20 the scrap 23 is wound onto the reel 22, driven by a motor reducer 164 after passing through a first return roller 166, a second return roller 168 in the vertical position of the first return roller 166, a tensioning roller 170 and a third return roller 172.

**[0047]** As shown in the Figures 16, 17, the dragging unit 24 comprises a motor reducer 174 that operates a dragging roller 176 fitted on a drive shaft 178 of the motor reducer 174. The dragging roller 176 frictionally engages an underlying contrasting roller 179; the sheet material 8, to be advanced along the direction F, is interposed between the dragging roller 176 and the contrasting roller 179.

**[0048]** The contrasting roller 179 is mounted onto a shaft 180 supported to a block 182 slidable on slides 186 and pushed again the dragging roller 176 by springs 184.

**[0049]** The block 182 is coupled to a tie-rod 188 operated by a crank handwheel 190 that allows the contrasting roller 179 to be disengaged from the dragging roller 176, acting through an eccentric 192, that is coupled to the lower end of the tie-rod 188.

## Claims

### 1. Apparatus, comprising:

- feeding means (11, 12, 24) for feeding sheet material (8) to a packaging station (7) of products (4);
- conveyor means (6, 6a, 6b) for conveying said products (4) to said packaging station (7);
- bar means (16a, 16b) movable along an operating stroke and provided with active elements arranged in order to seal strips of said sheet material (8) in said packaging station (7) so as to enclose said products (4) into said sheet material (8), characterized in that, said bar means (16a, 16b) are coupled to operating and driving means (134, 136, 148, 159, 160, 162) capable of keeping said active elements mutually parallel to each other at least during said operating stroke.

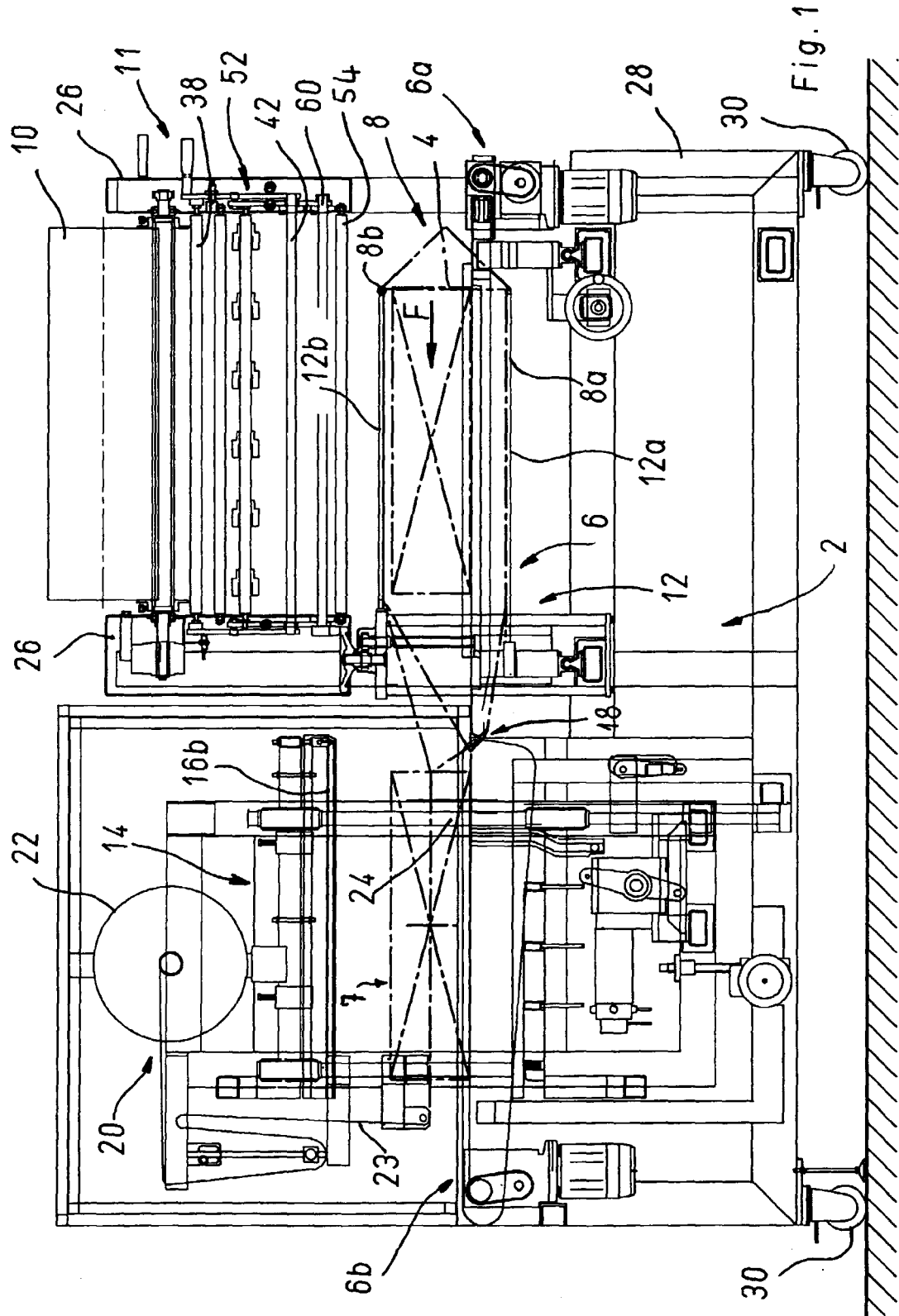
### 2. Apparatus comprising:

- feeding means (11, 12, 24) for feeding sheet material (8) to a packaging station (7) of products (4);
- conveyor means (6, 6a, 6b) for conveying said products (4) to said packaging station (7);
- bar means (16a, 16b) movable along an operating stroke and provided with active elements arranged in order to seal strips of said sheet material (8) in said packaging station (7) so as to enclose said products (4) into said sheet material (8), characterized in that, comprises at least a group selected between:
  - unwinding group (32, 36, 38, 39, 52, 54) of the sheet material (8);
  - conveying group (6a) of the products (4) to be packaged in order to direct them towards said packaging station (7);
  - conveying group (6b) of the packaged products (4) in order to extract them from said packaging station (7);
  - dragging group (24) of the sheet material (8) in order to drive said sheet material (8) to the packaging station (7);
  - scrap rewinding group (20) of said sheet material (8); and that said at least one group is supported to frame means (28) in a modular manner.

### 3. Apparatus comprising:

- feeding means (11, 12, 24) in order to feed sheet material to a packaging station of products (4);

- conveyor means (6, 6a, 6b) in order to convey said products (4) to said packaging station (7);
  - bar means (16a, 16b) movable along an operating stroke and provided with active elements arranged in order to seal strips of said sheet material (8) along a sealing plane in said packaging station (7) so as to enclose said products (4) into said sheet material (8), characterized in that, means (140, 142, 144) is provided in said packaging station (7) for adjusting the height of said sealing plane.
4. Apparatus comprising an unwinding group (32, 36, 38, 39, 52, 54) for unwinding sheet material (8), including support means (32) for a reel (10) of said sheet material (8); roller means (38, 39, 52, 54) for driving said sheet material (8) during the unwinding from said reel (10), characterized in that, said roller means comprises a floating roller (38) which moves along a curved path (44) and may be blocked in a disengagement position (45) in which it does not interfere with said sheet material (8) coming down from said reel (10).
  5. Apparatus according to claim 2, or 3, wherein said bar means (16a, 16b) are coupled to operating and driving means (134, 136, 148, 159, 160, 162) such to keep said active elements mutually parallel to each other at least during an operating stroke thereof.
  6. Apparatus according to any of the preceding claims, wherein said operating and driving means (134, 136, 148, 159, 160, 162) comprises upper window frame means (150) and lower window frame means (153) associated to said bar means (16a, 16b) interconnected to motor reducer means (160) through connecting rod means (159, 162).
  7. Apparatus according any of the preceding claims, wherein said operating and driving means (134, 136, 148, 159, 160, 162) comprises frame means (134) associated to said bar means (16a, 16b) and mounted onto vertical external guide means (136), so as said frame means (134) can be operated to vertically translate by height positioning means (140, 142, 144).
  8. Apparatus according to claims 6 and 7, wherein said window frame means (150, 153) are coupled to said frame means (134) through vertical internal guide means (148).
  9. Apparatus according to one of the claims 1 to 3, or 5 to 8 when depending on one of the claims 1 to 3, wherein said feeding means (11) comprises an unwinding group (32, 36, 38, 39, 52, 54) of the sheet material (8).
  10. Apparatus according to claim 9, wherein said unwinding group (32, 36, 38, 39, 52, 54) comprises a floating roller (38) which moves along a curved path (44) and may be blocked in a disengagement position (45) in which it does not interfere with said sheet material (8) coming down from said reel (10).
  11. Apparatus according to any of the preceding claims, wherein sensor means (66, 68) is arranged along said curved path (44).
  12. Apparatus according to any of the preceding claims, wherein said unwinding group (32, 36, 38, 39, 52, 54) further comprises a pair of piercing rollers (52) of said sheet material (8), one of which movable along curved path means (62) so as to be blocked in a disengagement position in which it does not interfere with said sheet material (8) coming down from said reel (10).
  13. Apparatus according to any of the preceding claims, wherein said conveyor means (6) comprises first and second conveyor means (6a, 6b) arranged consecutively and coupled to means (126, 128) for the control of the mutual distance in order to convey said product (4) into said packaging station (7).
  14. Apparatus according to claim 13, wherein said control means comprises cam means (126, 128).
  15. Apparatus according to any of the preceding claims, wherein said cam means (126, 128) comprises a movable element (128) associated to the movement of said bar means (16a, 16b).
  16. Apparatus according to any of the preceding claims, and further comprising a scrap rewinding group (20) of said sheet material (8).
  17. Apparatus according to any of the preceding claims, wherein said feeding means comprises a dragging group (24) of said sheet material in order to drive said sheet material (8) to the packaging station (7).
  18. Apparatus according to any of the preceding claims, wherein said dragging group (24) comprises a couple of dragging rollers (176, 179), one (176) of which motorized, the other one (179) coupled to disengagement means (188, 190) provided with eccentric (192).



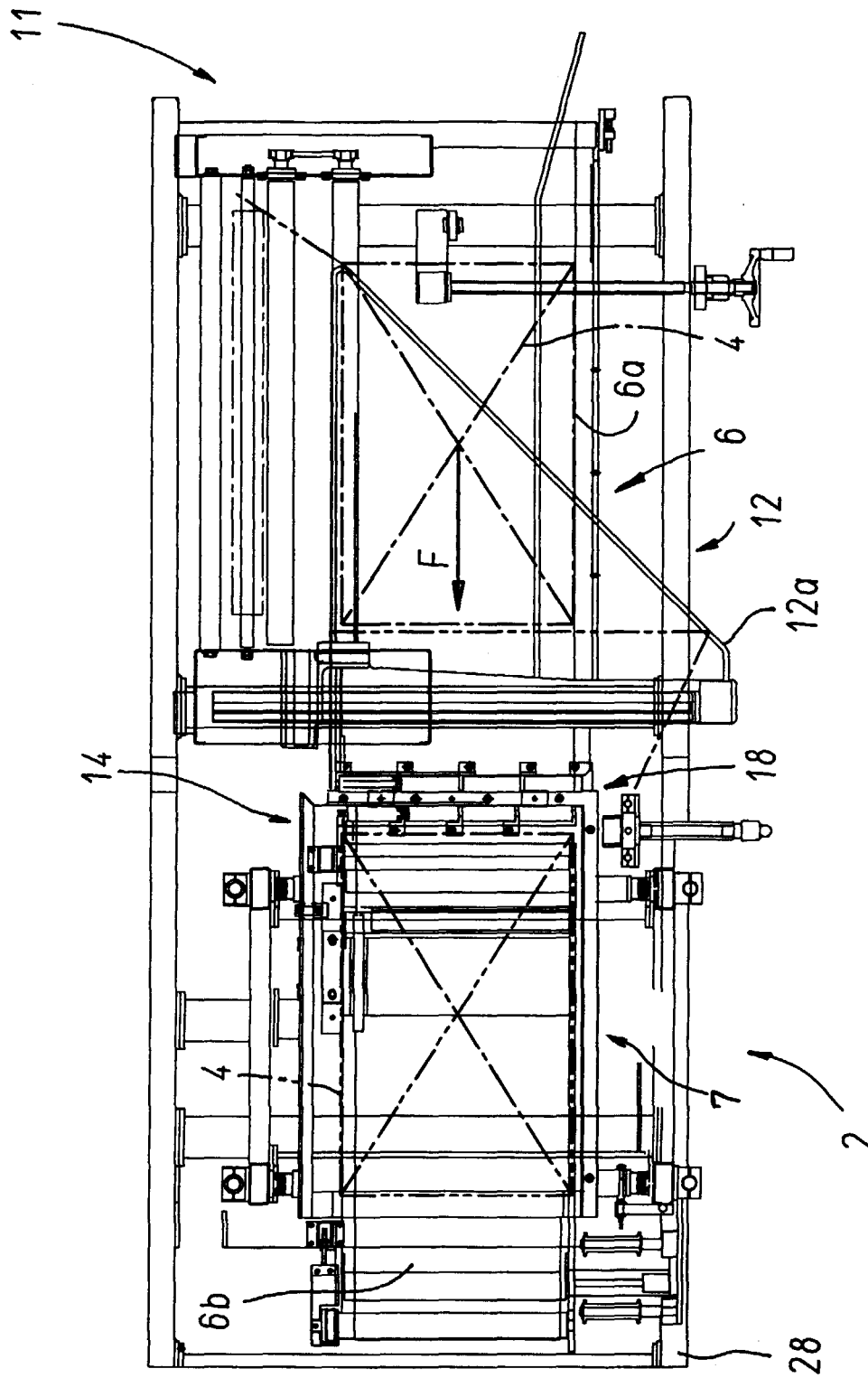
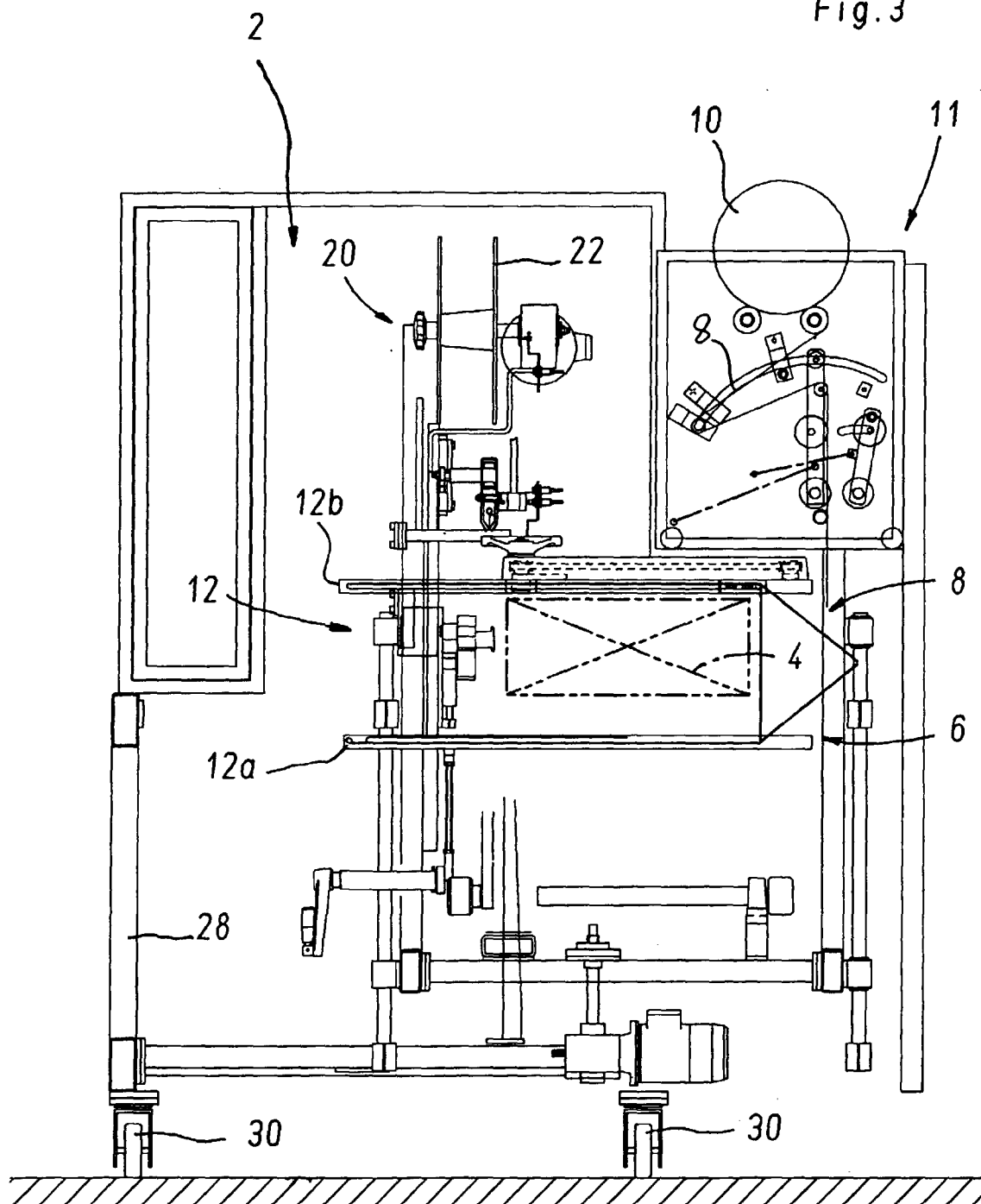
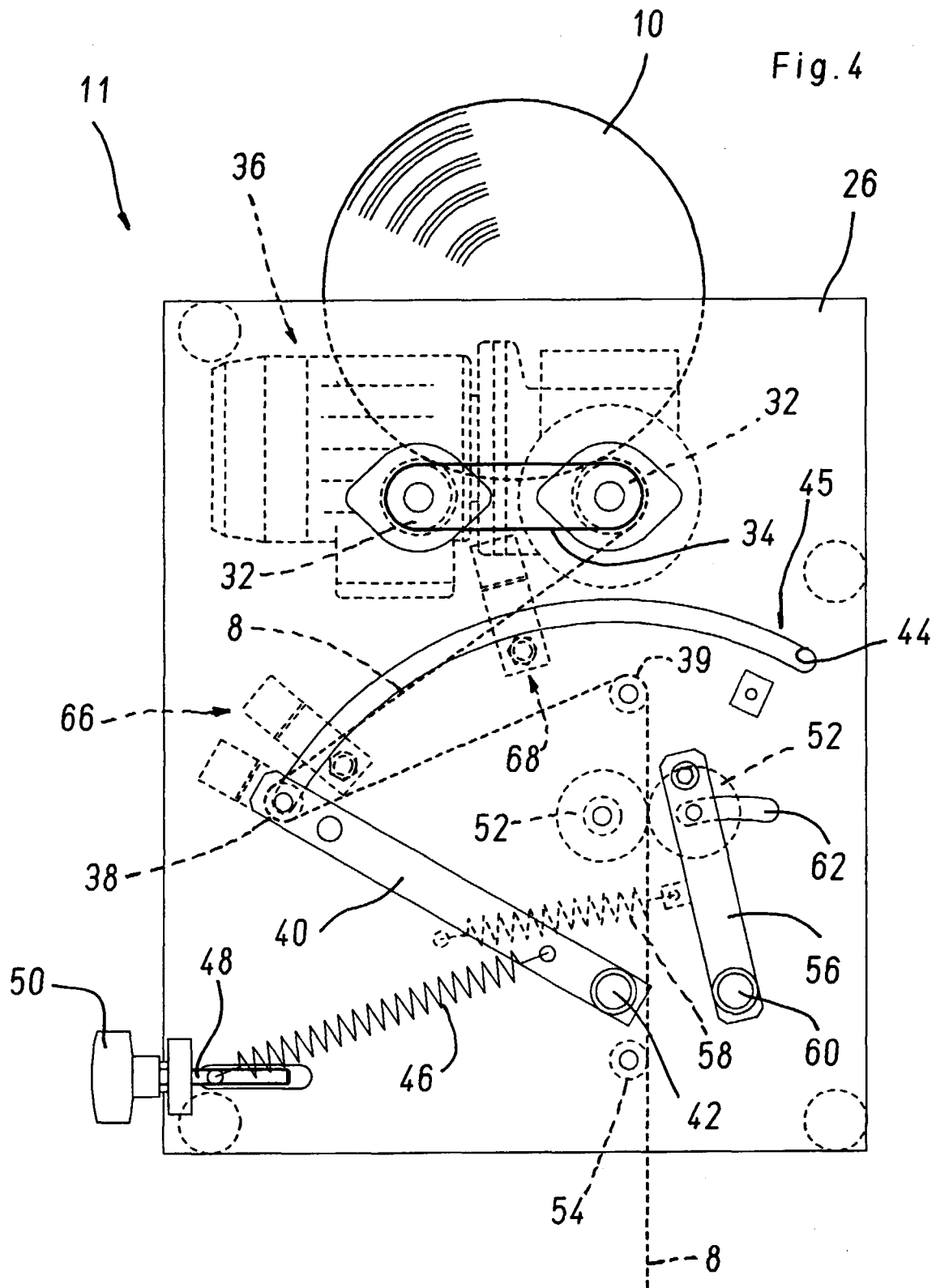


Fig. 2



Fig.3





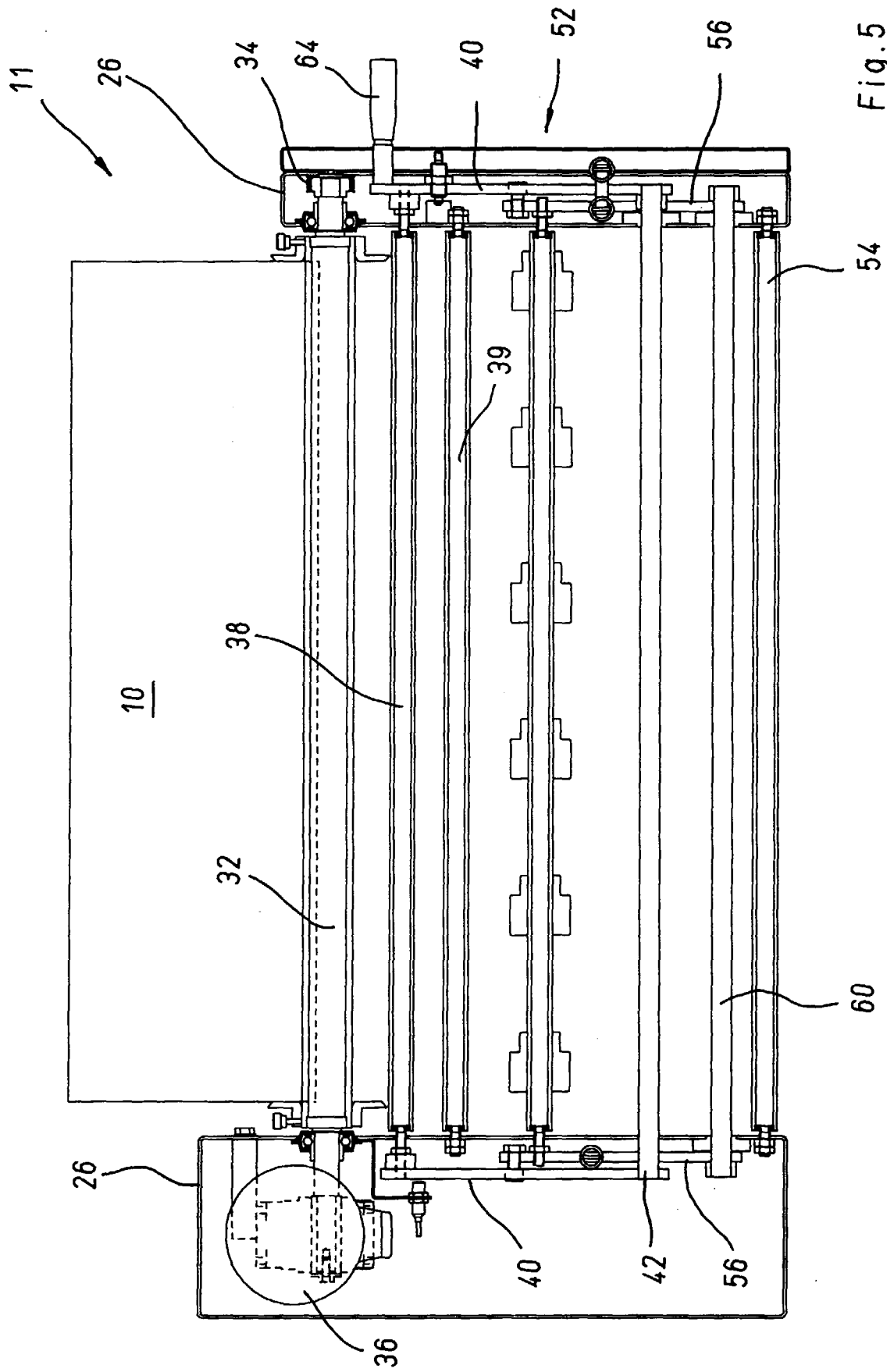
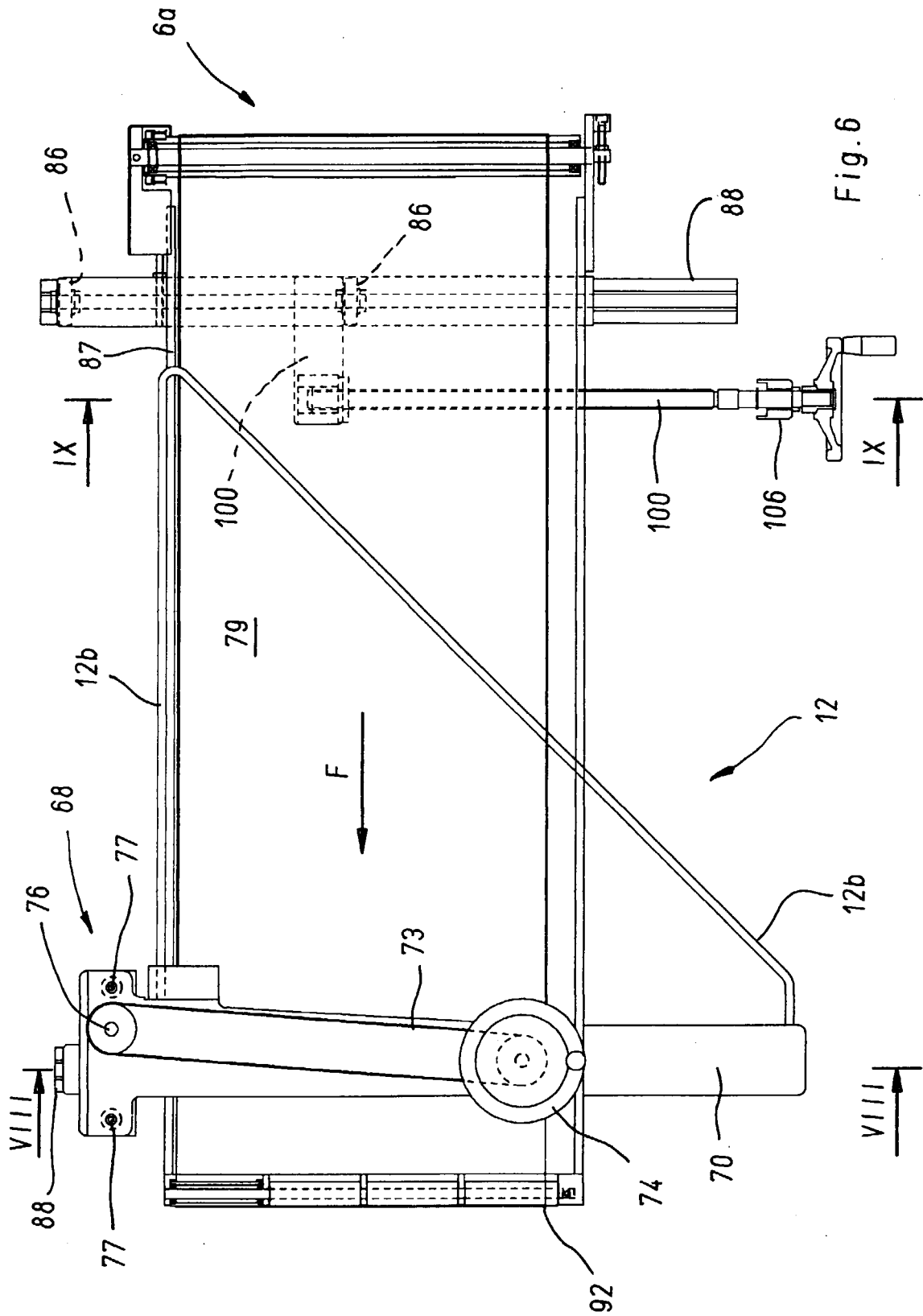


Fig. 5



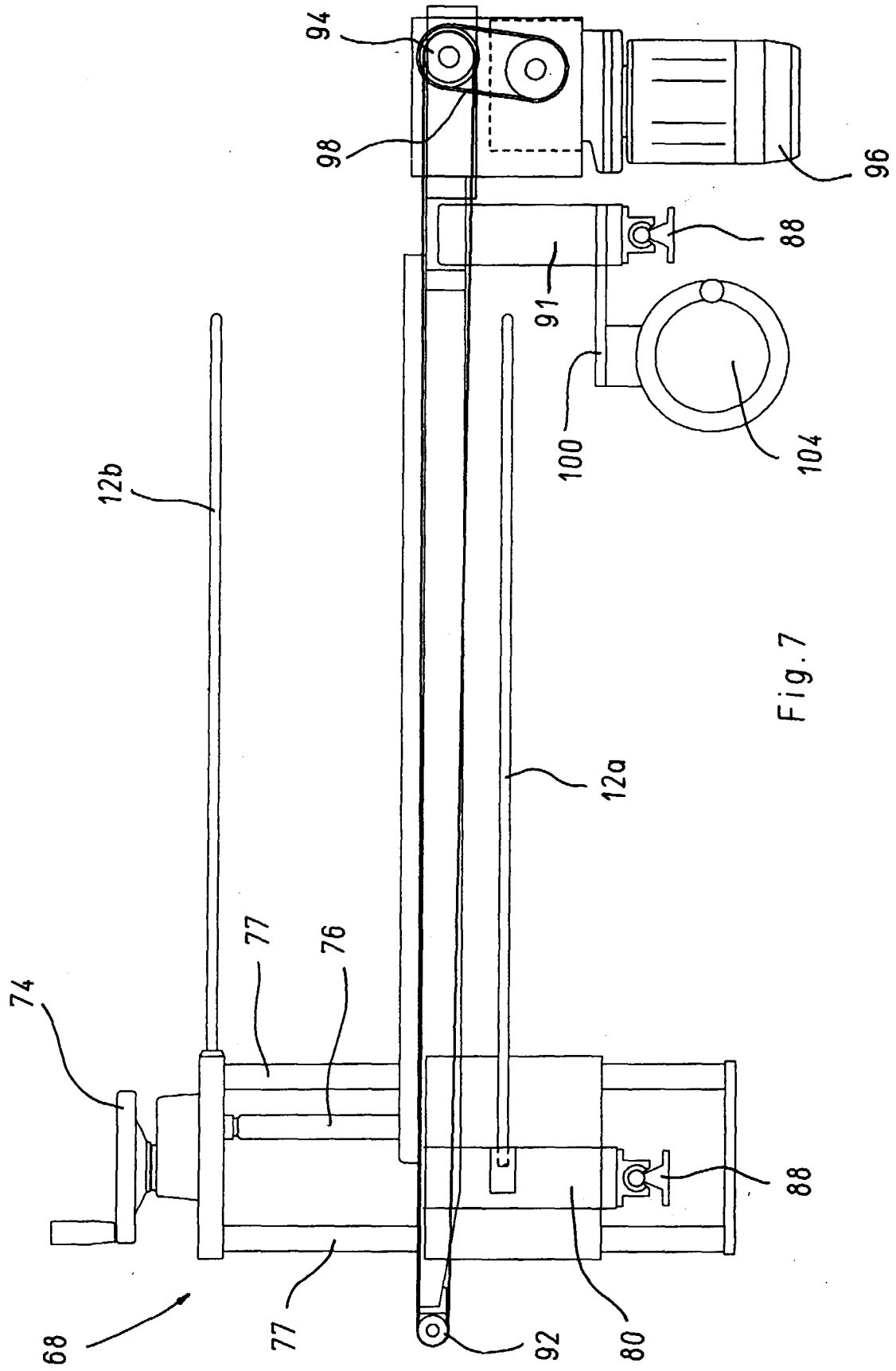
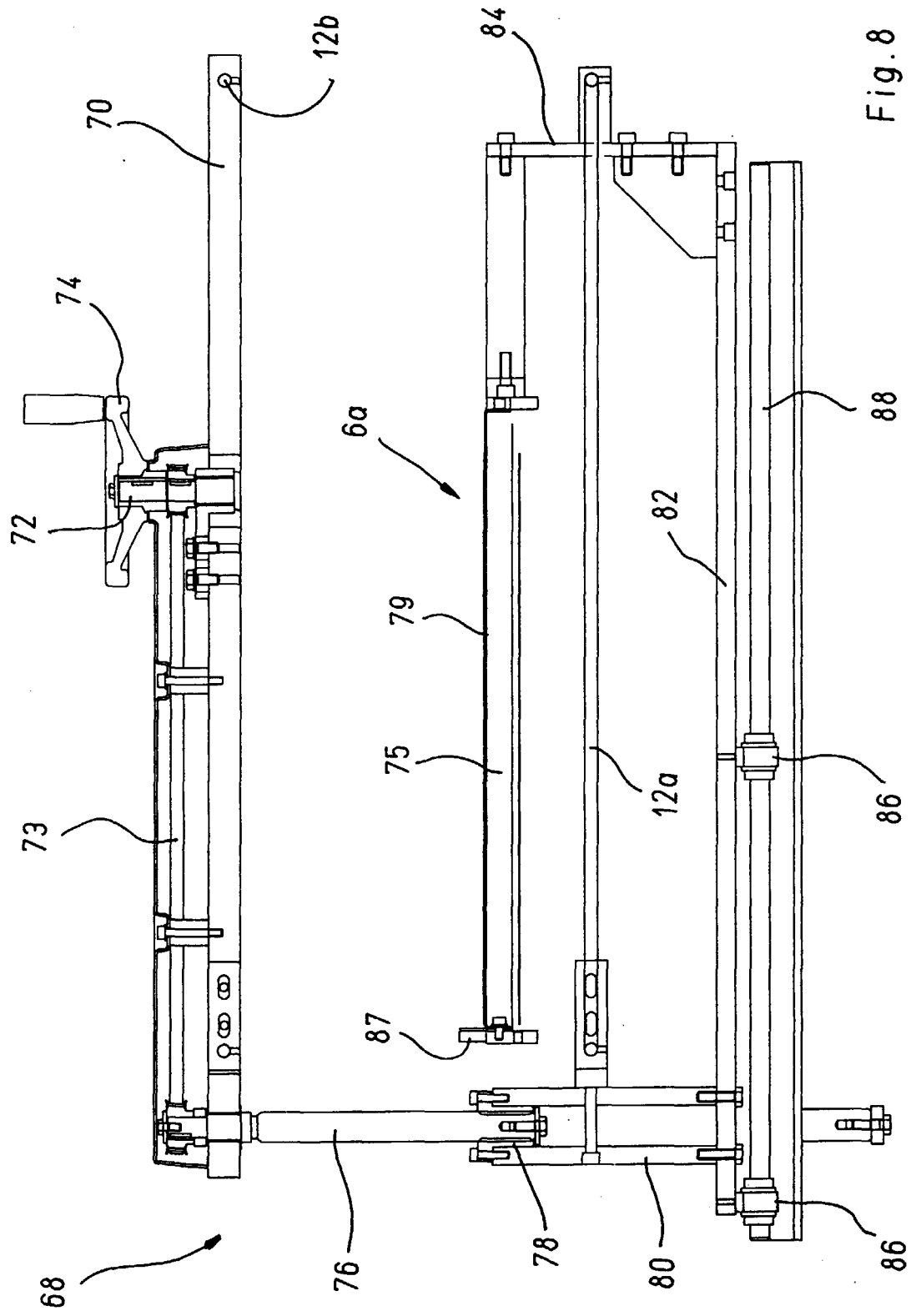


Fig. 7



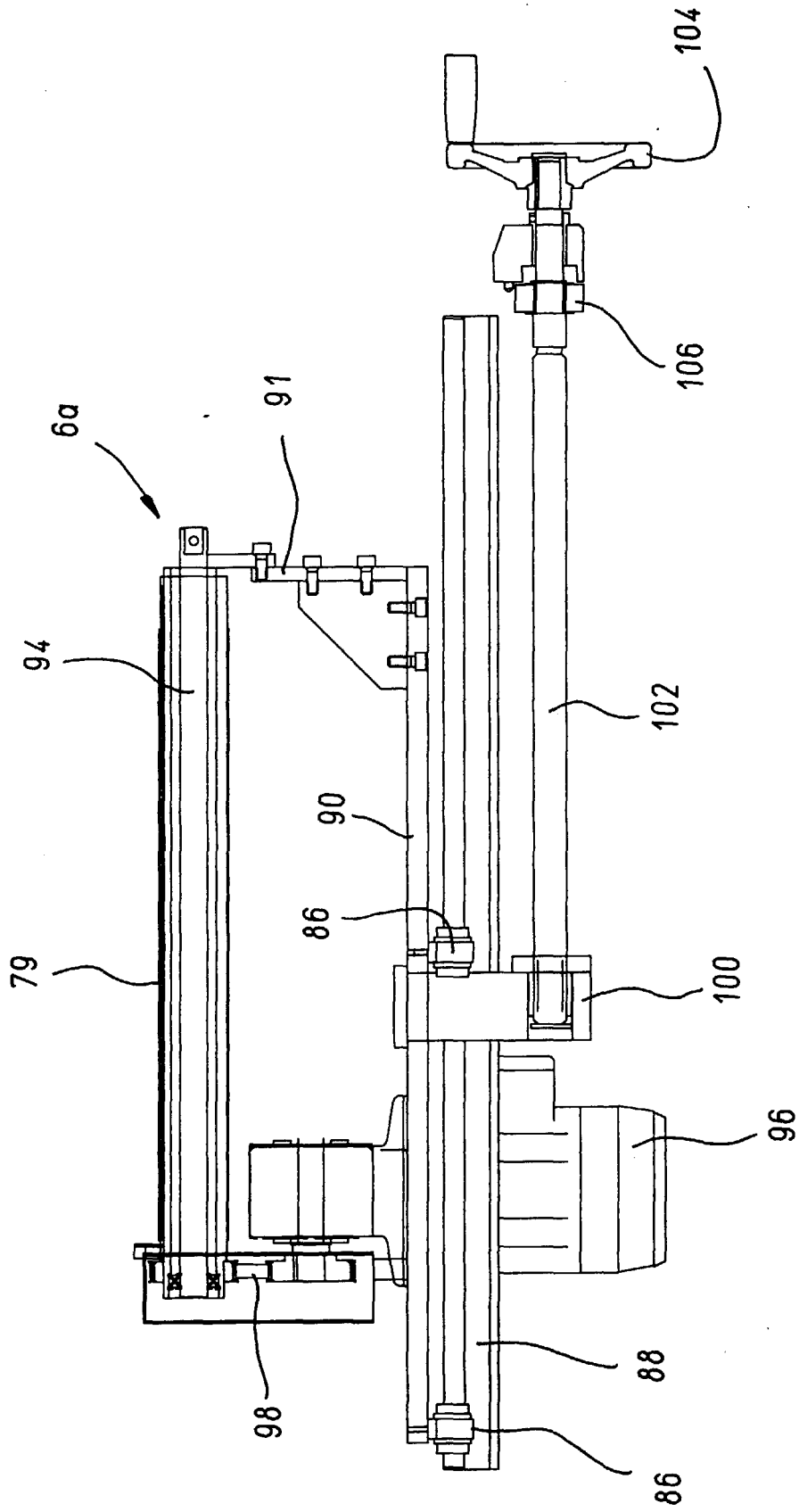


Fig. 9

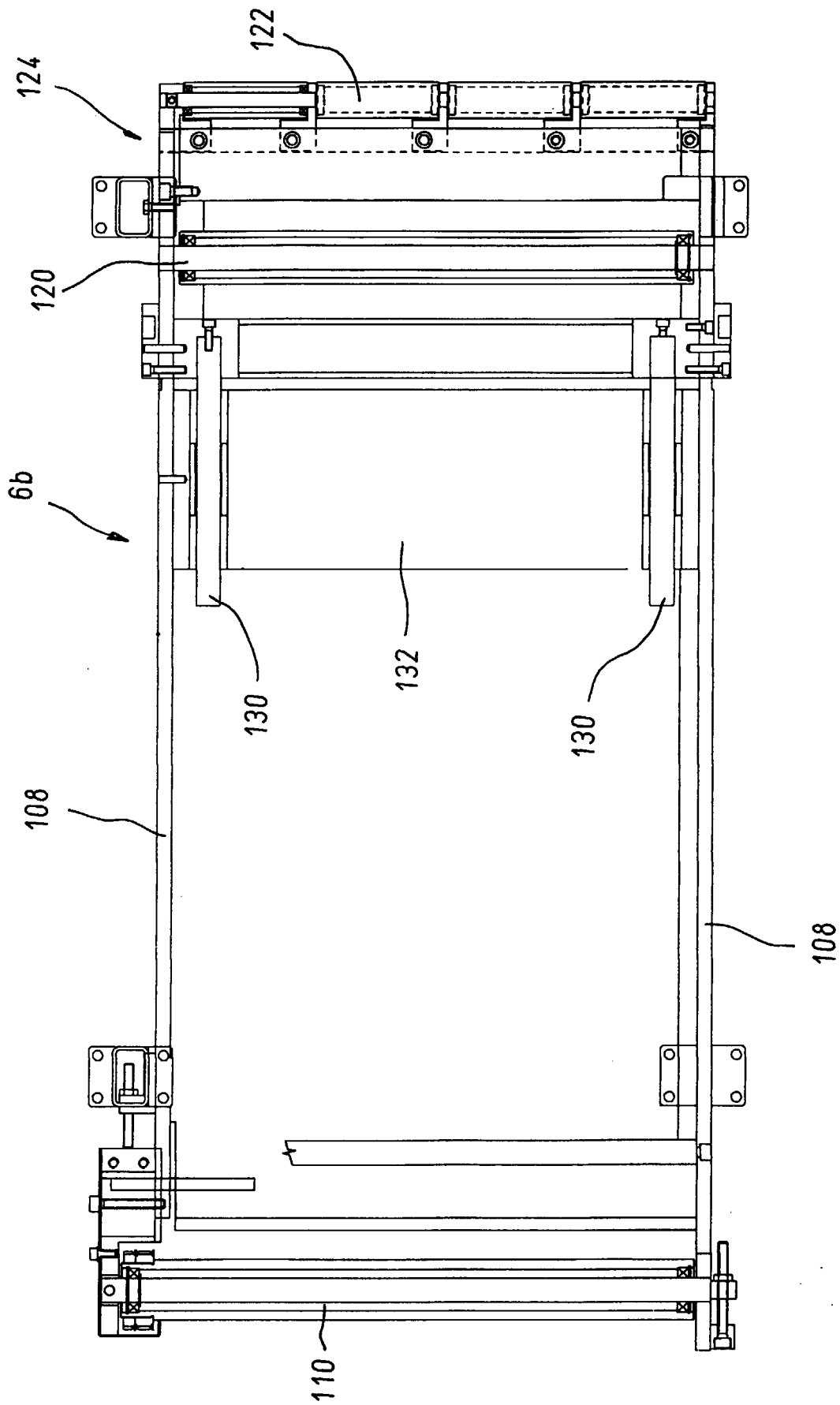


Fig. 10



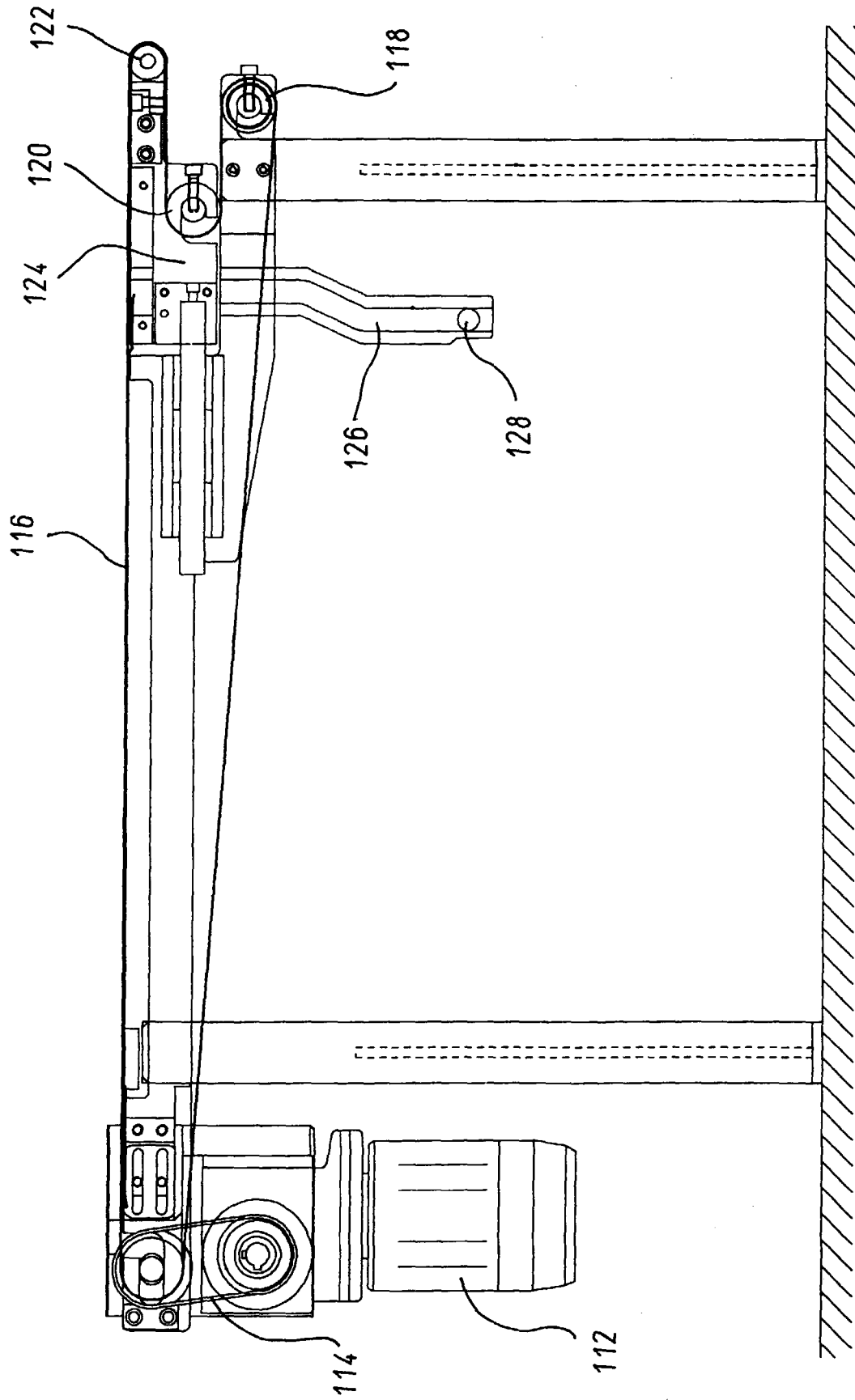
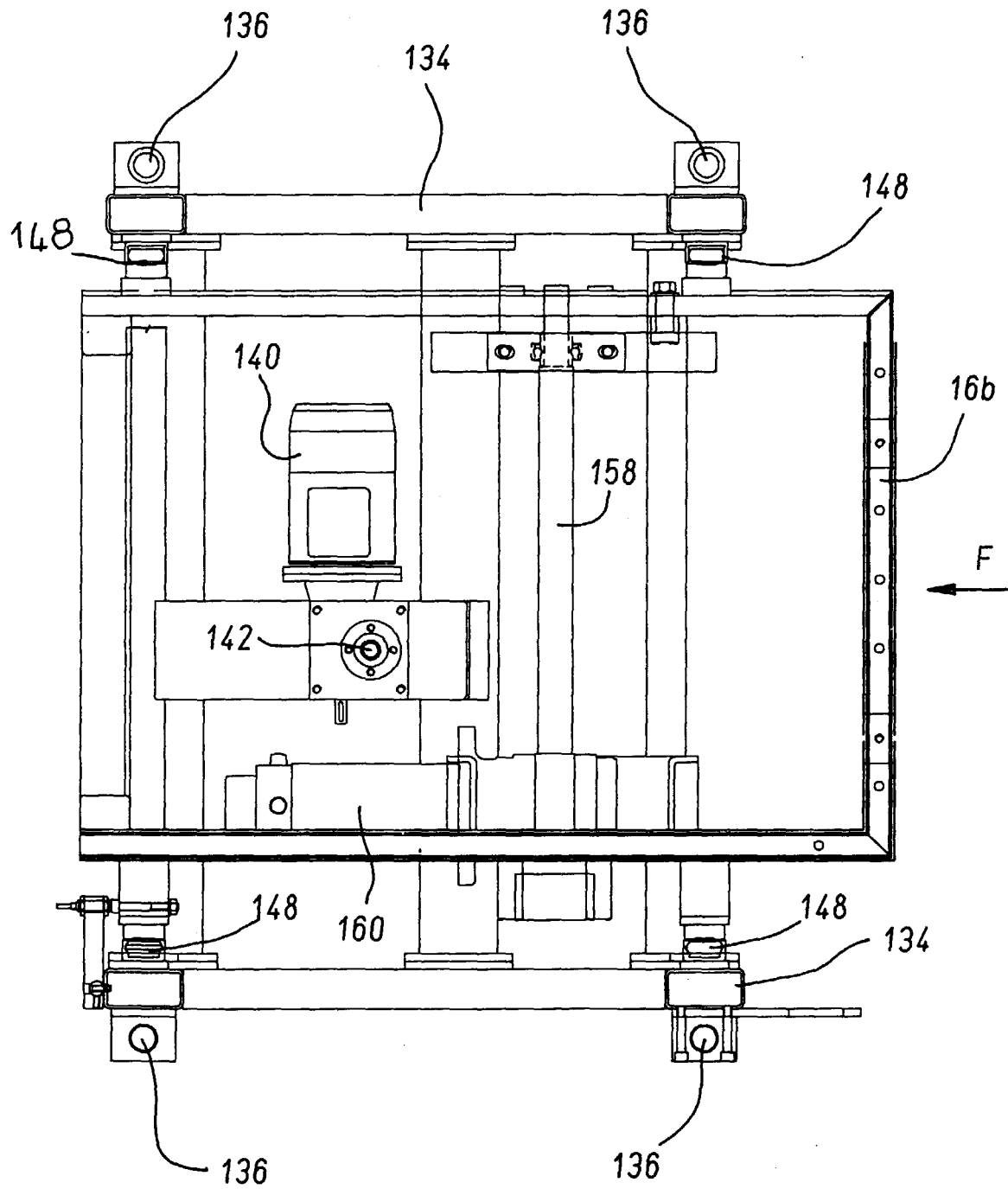


Fig. 11

Fig. 12



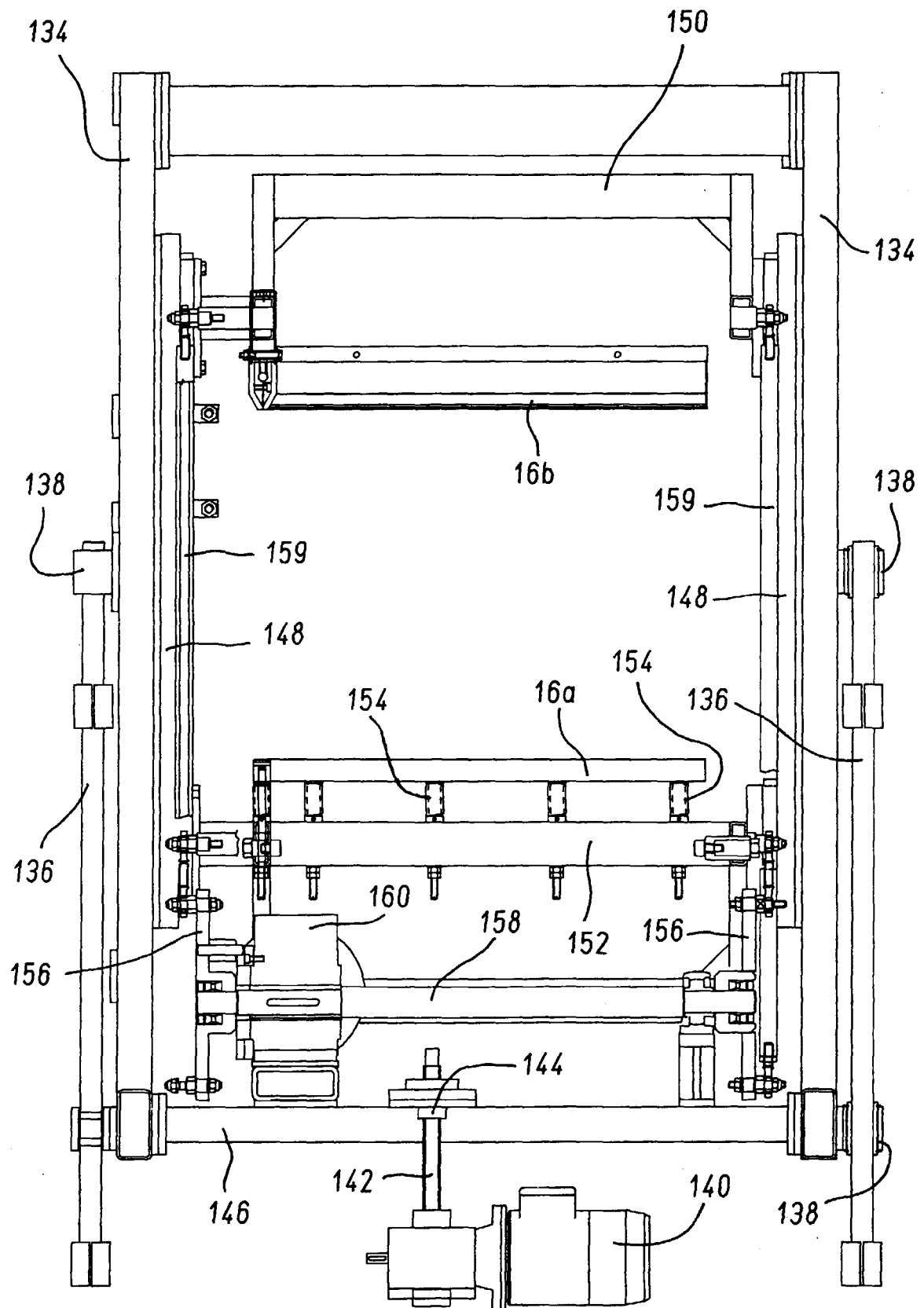
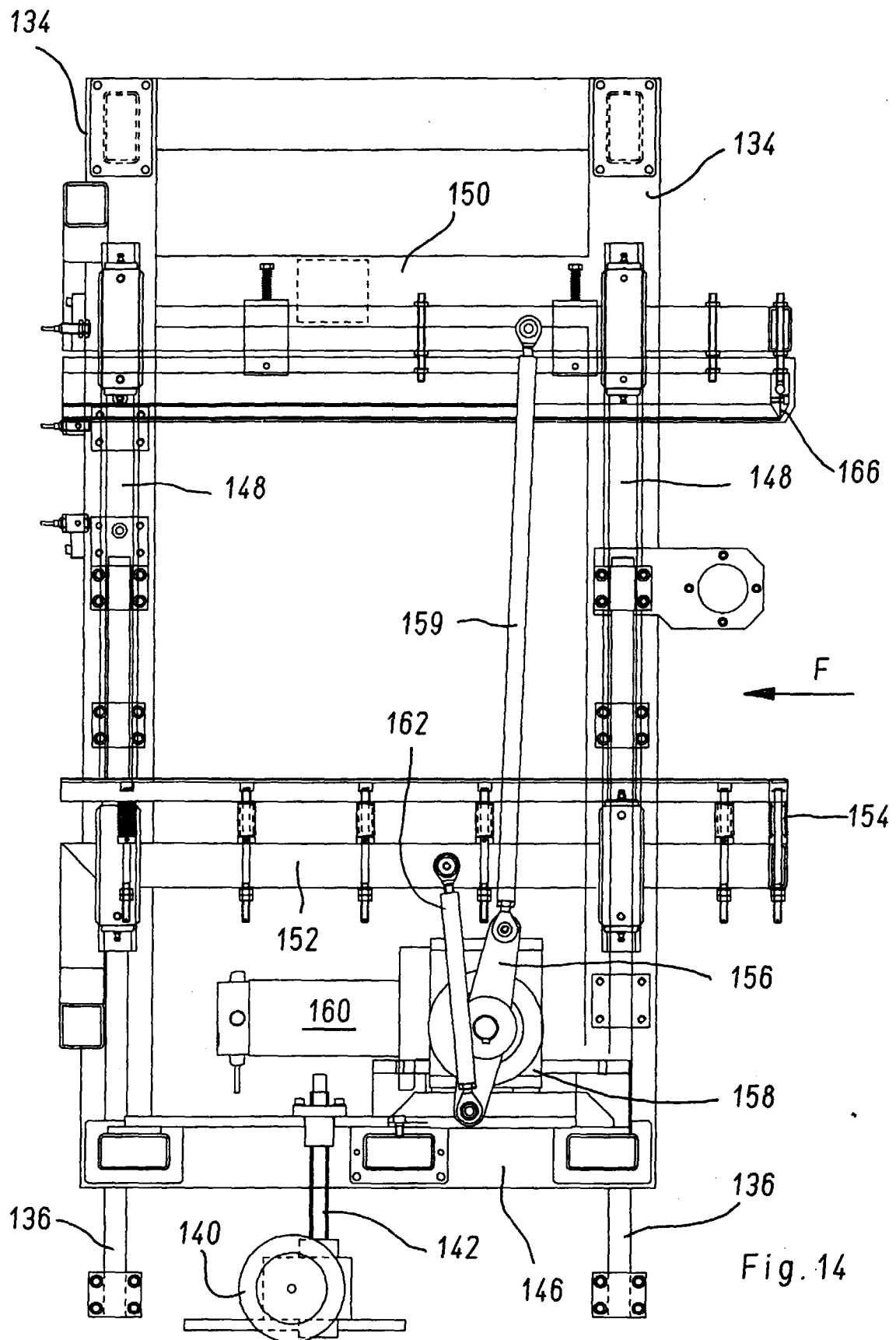
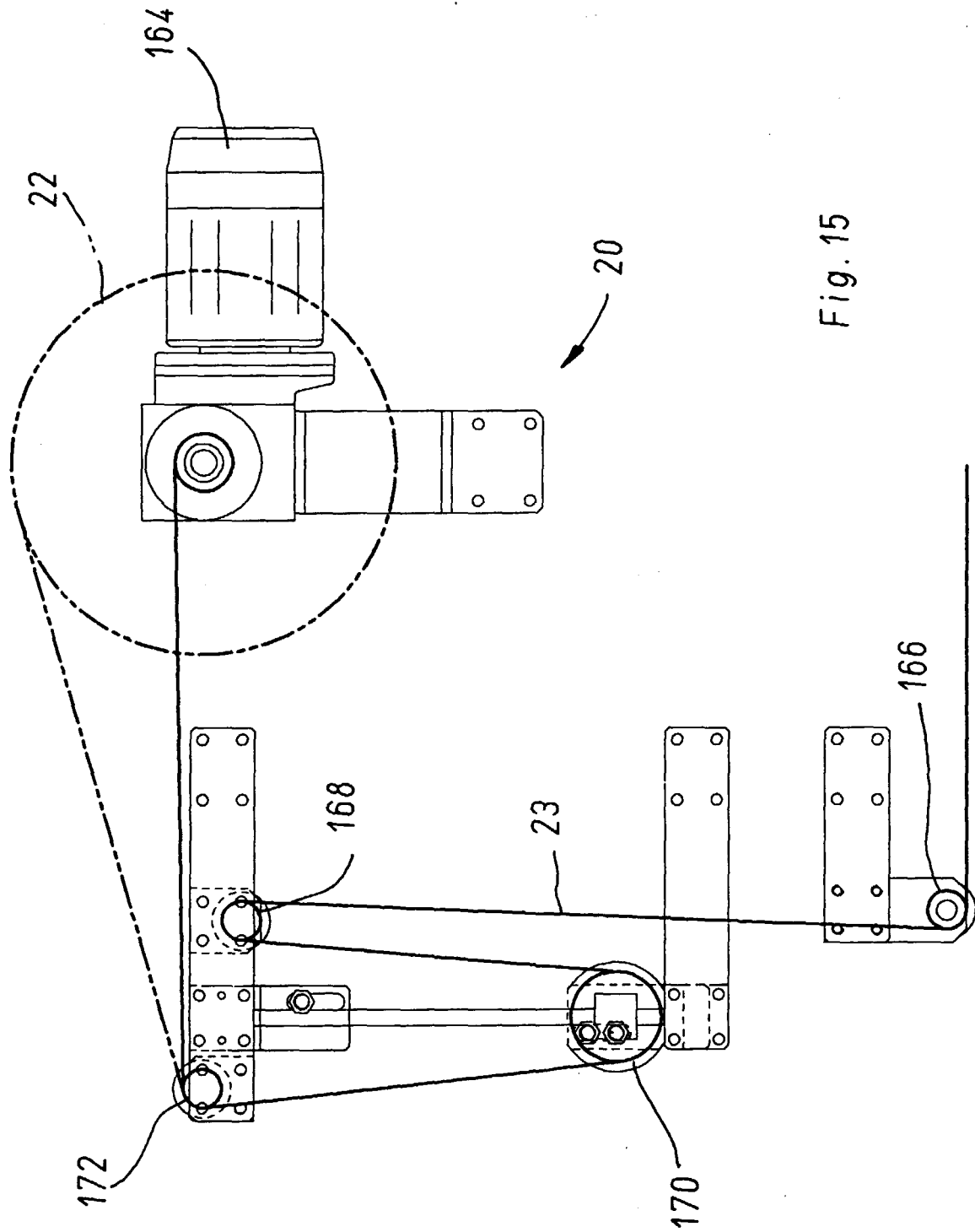


Fig. 13





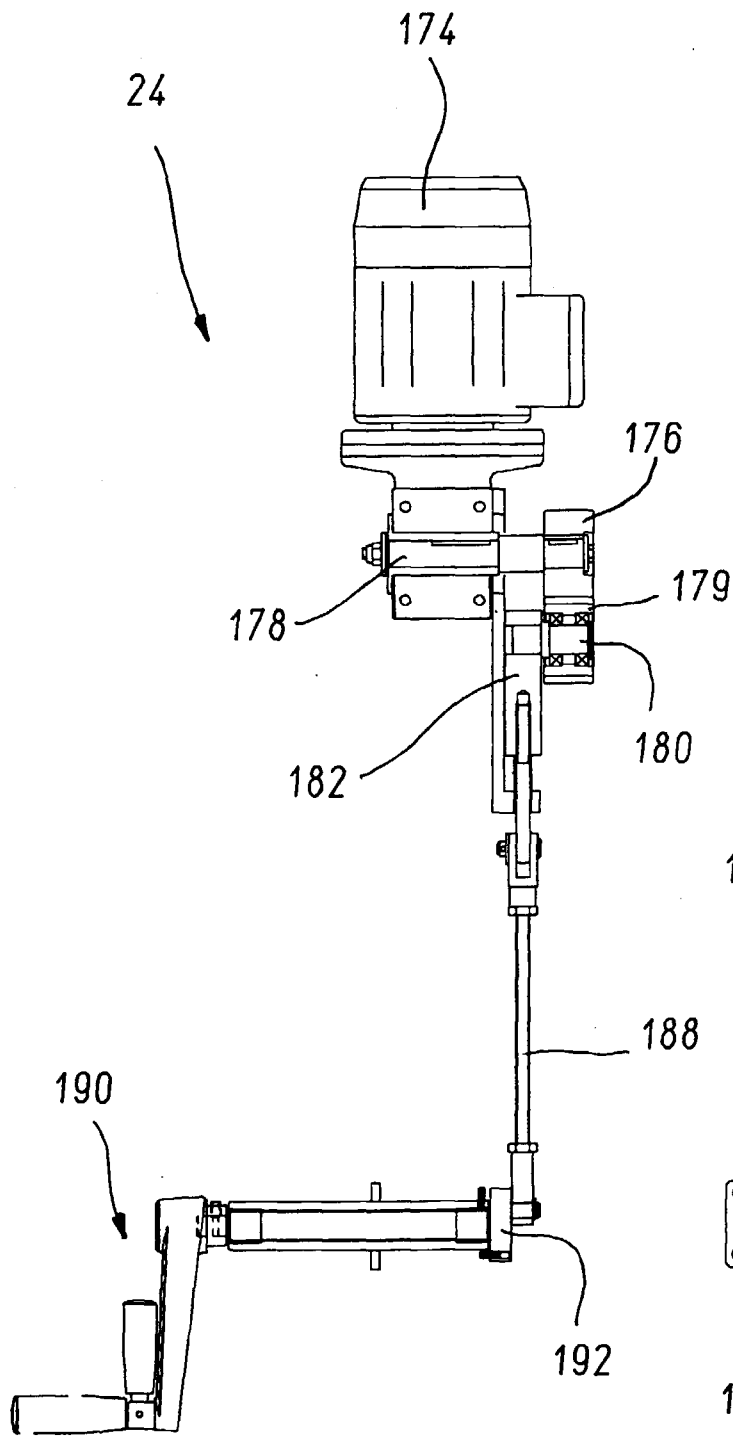


Fig. 17

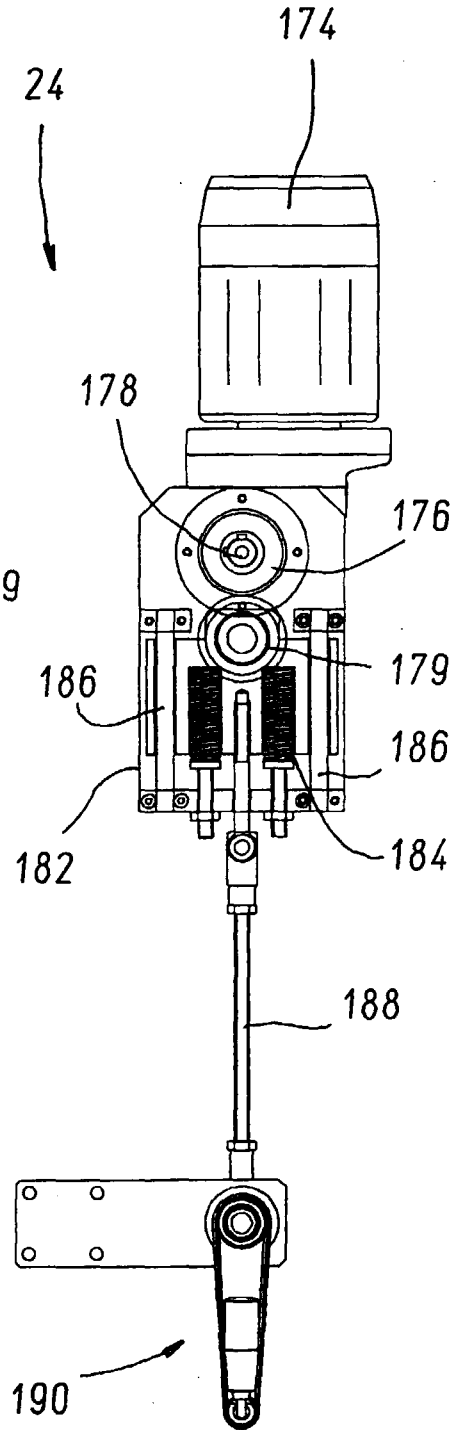


Fig. 16