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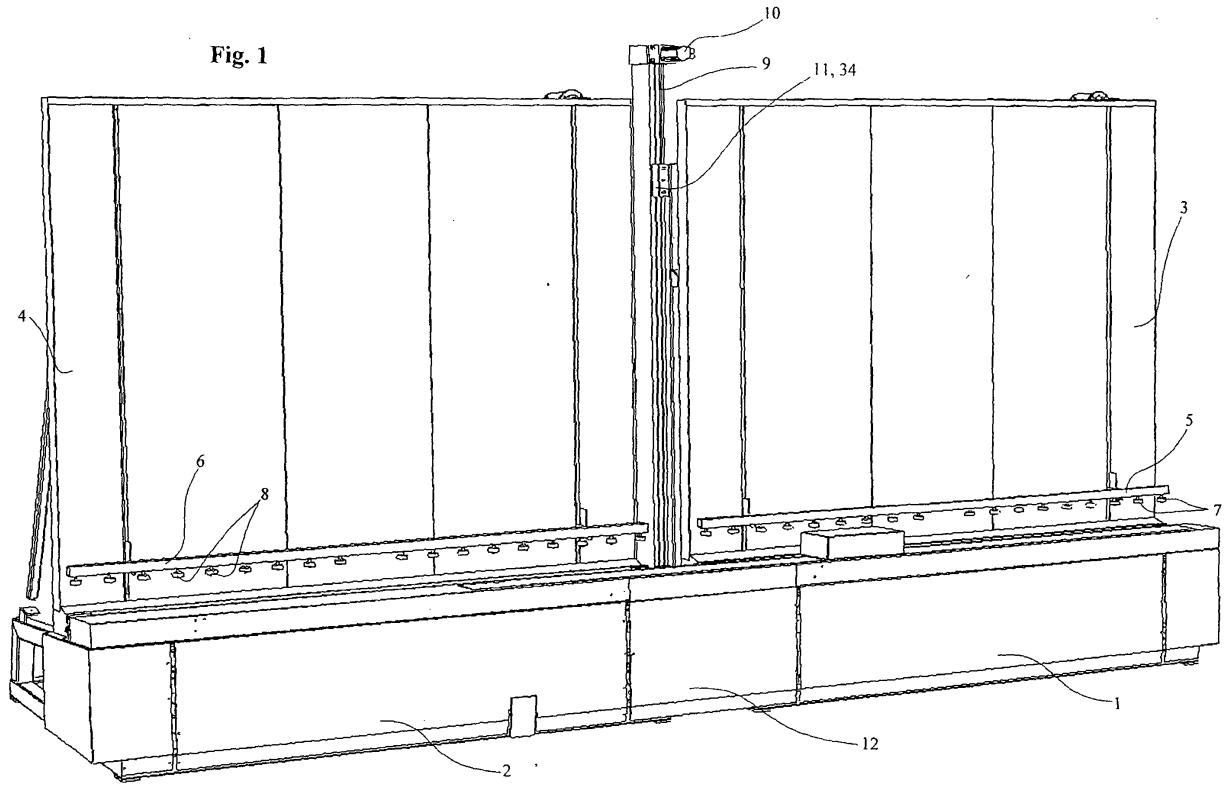
(71) Applicant: **I.Tech s.r.l.**
35010 Onara di Tombolo PD (IT)

(72) Inventor: **Andretta, Benvenuto**
35010 Onara di Tombolo PD (IT)

(54) **Improved machine for the sealing of insulating glass sheets**

(57) This is an improved machine for the sealing of insulating glass panes including two alignment benches with a space between them with the head unit positioned in said spacing with a sealant delivery nozzle and a feeler pin, with both benches fitted with block-carrying chains for moving the insulating glass panes whose perimeter cavity needs sealing. The improvement concerns in particular the arrangement of the two benches, the movement of the blocks and the addition to the head unit of a device for smoothing out the excess sealant protruding from the cavity, left by the nozzle when the head unit changes direction at the corners of the insulating glass pane.

Fig. 1



EP 1 783 313 A2

Description

[0001] The composition of insulating glass is well-known.

[0002] In most cases insulating glass is composed of two sheets of glass placed close together with the interposition of a spacing frame fixed along the sides to the inner surfaces of the sheets using special adhesives that constitute two main gaskets that create the seal against the communication between the space of the inner chamber established by the frame and the space outside the frame.

[0003] The outer edge of the frame, with respect to the dimensions of the glass sheets held together by the aforesaid frame with relative bonding gaskets, is appropriately sunken creating a cavity along the entire perimeter.

[0004] To complete the insulating glass the cavity is filled with suitable sealants.

[0005] The application of these sealants is carried out using a suitable machine.

[0006] The existing machines on the market for the aforesaid sealants are summarised below.

[0007] They are composed of two alignment benches with a spacing between them, in which the sealer delivery nozzle can be found.

[0008] Each bench is equipped with two motorised chains fitted with guide blocks arranged in an L-shape on which the insulating glass to be sealed around the edges is loaded in a near vertical position to be transported along the benches.

[0009] In order to provide side support for the pane, which is inclined by a few degrees with respect to the vertical, each bench is constructed with a lateral back, with horizontal bars (the height of which can be adjusted) that support a series of rollers, on which the inclined side of the sheet rests.

[0010] When the insulating glass reaches the space between the two benches, where the sealant delivery nozzle is located, its cavities are sealed. The size of the cavity is determined by the depth of the outer flange of the spacer frame and by the space between the two internal surfaces of the sheets that make up the insulating glass.

[0011] During the sealing process the insulating glass is moved by the chains horizontally for the filling of the horizontal cavities and is held firm for the filling of the vertical cavities, with vertical movements of the nozzle.

[0012] In the case of rectangular insulating glass the sealer delivery nozzle is controlled in such a way that the mouth of the nozzle is directed downwards during the sealing of the cavity on the upper part of the glass.

[0013] When the delivery nozzle is at the outlet corner, because the vertical channel of the adjacent side has to be filled, its direction is changed, rotating 90° to put the mouth in the horizontal against the vertical cavity, and then it is made to descend.

[0014] Once the outlet corner of the vertical side has been reached the nozzle is made to rotate another 90° putting the nozzle mouth up against the lower horizontal cavity.

[0015] To complete the sealing, the nozzle is made to rotate another two times to change direction so that is in line with the other two corners.

[0016] The existing sealing machines for double glazing that were described above have, however, some drawbacks regarding costly operational waste and the fact that they require expensive manual operations for adjusting the sealing.

[0017] One of the key disadvantages of machines currently on the market comes from the fact that the drums that move the chains, fitted with guide blocks for supporting and moving the insulating glass sheets along the benches, have vertical axes, so the four sections of the chains are all on the same plane.

[0018] This means that in the initial section, where the insulating glass is introduced between the internal sections of the chains, the guide blocks come against the surface of the inclined glass, exercising unequal pressures before it is moved along horizontally, leading to possible glass breakage and consequent production waste.

[0019] In the absence of special devices, or because of operator negligence, the amount of unusable glass can mount up, producing large economic losses.

[0020] Another drawback of existing machines is that the sealing along the perimeter of standard insulating glass has excess sealant protruding in the corners left by the delivery nozzle when it has to rotate to change direction.

[0021] This means that once the sealing has been completed the excess sealant, in the form of lumps, has to be removed from the corners.

[0022] This tidying up operation is quite expensive and has still to be perfected.

[0023] The purpose of this patent is therefore to present sealing machines for insulating glass that have overcome the above-mentioned drawbacks.

[0024] To avoid the abnormal pressures exercised by the guide blocks that in the initial section of the chains are placed against the inclined surfaces of the glass sheets, the axes of the drums that move the chains are place in the horizontal, so the departing sections (upper ones) and the returning sections (lower ones) of the chains are on the same vertical plane.

[0025] The blocks involved in the support and the holding of the glass for its movement forward meet the surface of the glass parallel to the surfaces of the above-mentioned glass that has been loaded.

[0026] To assist in the positioning of the blocks that come from underneath and to facilitate the positioning of the glass on the blocks of the a vertical layout is used in which the two chains run counter instead of parallel in a small opening towards the entrance.

[0027] To prevent, on the other hand, lumps of sealant being left by the nozzle in the corners a shaving/smoothing device is installed on the head unit that moves the

nozzle, which is operated by a sensor that detects when the nozzle is getting close to a corner so that the direction can be changed.

[0028] This device allows a roller to rest on the outside of the cavity of the glass that goes for a short distance before the corner where the nozzle has just been operating.

[0029] When the corner has been reached, the roller continues its course once it has changed direction, resting on the outside of the cavity of the glass for a further short stretch before detaching.

[0030] In these short stretches the roller carries out the smoothing/shaving by trimming the excess sealant.

[0031] There are numerous ways of making the smoothing device, but the application is nonetheless an original concept.

[0032] What has been said so far is clarified in the attached drawings.

[0033] Fig. 1 is a frontal view of the sealing machine including the two alignment benches for moving the insulating glass to be sealed, both of which are fitted with a lateral support back equipped with a bar with a horizontal roller-holder for the lateral support of the glass.

[0034] The roller-bearing bars can be positioned and fixed at various heights.

[0035] Between the two benches, including the back , there is a space in which the assembly with the sealant delivery nozzle goes up and down, a feeler pin for the assessing the depth of the cavity of the glass to be sealed and the smoothing device for the excess sealant that might be found in the corners of the glass panes.

[0036] You cannot see the chains that move the guide blocks that support and move the insulating glass because the machine has a hood installed.

[0037] Fig. 2 is an overhead view of the first bench without its hood

where the chains that move the guide blocks for transporting the insulating glass can be seen. A part of the front of an insulating glass panel can be seen with the empty cavity to be filled with sealant, positioned at the start in the space where the guide blocks of the two chains face each other. It can be noted how the lateral faces are parallel to each other also in the first guide blocks that have just gone up, powered by the lower sections of the chains.

[0038] Fig. 3 is an overhead view of the first bench in fig. 2.

[0039] Because of the hood only the guide blocks can be seen but not the chains. The front part of the glass panel can be seen which in fig. 2 had entered the space established by the guide blocks that are supporting it.

[0040] Fig. 4 is an overhead side-frontal axonometric view of the initial part of the first bench. The chains with the guide blocks that come up from the lower section can be seen, as can one of the upper sections with a horizontal arrangement.

[0041] The lower and upper drums of one of the two chains can be seen into which the lower section is engaged, the section coming up continually with the upper section.

[0042] There is a glimpse of a part of the back support with a portion of the bar with revolving roller for supporting the side of the glass panel.

[0043] Fig 5 is an overhead side and front axonometric diagram of the initial part of the first bench very similar to fig. 4, where in addition to the upper and lower drums of the block-carrying chains the positive drive belts that move the lower drums can be seen; said belts being moved by chain wheels joined to a drive shaft.

[0044] One can note the grooved feature of the drive shaft along which the chain wheel (not visible), joined to it, can run when the entire vertical structure carrying the movement rollers of one of the two block-carrying chains is shifted to distance itself from the fixed opposed vertical structure in order to regulate the width of the space established by the opposed guide blocks of the two chains.

[0045] Fig. 6 is an overhead and frontal axonometric view, without the machine cover, of the final part of the first bench and the start of the second bench, highlighting the space that exists between them.

[0046] We can see the drive for moving the block-carrying chains from the first bench to the second bench by means of a drive belt, synchronising all the sections of the block-carrying chain.

[0047] It can be seen that the same amount of transversal shift of the mobile vertical structure of the first bench, for regulating the space between facing blocks of the two chains, is obtained for the mobile vertical structure of the second bench by having an uninterrupted connection between the shaft holding the lever of the first bench and the shaft of the second bench.

[0048] The transversal movement of the mobile vertical structures, without altering its parallel arrangement, is carried out by the shifting of an end of a lever arm where the end of the opposed arm goes through the stroke of the shaft of a piston to which it is connected. The linkage of the shafts, which keeps the corresponding levers pivoted, establishes the same degree of transversal shift of the above-mentioned vertical mobile structures of both the benches.

[0049] Fig. 7 is the same as fig. 6 except for a view of the different angle position assumed by the lever moving the mobile vertical structures of the two benches.

[0050] Fig. 8 shows the assembly head, which is located in the space between the two benches, the nozzle, the feeler pin and the device for shaving off the excess sealant in the perimeter cavity of an insulating glass panel in a final position of one of the sides.

[0051] While the head unit remains at a standstill in the position it finds itself and the delivery nozzle is operating and the depth feeler pin for the cavity is resting on the outer flange of the spacer frame, the glass panel moves to bring the corner in line with the nozzle.

[0052] The shaving device is inoperative.

[0053] Fig. 9 and fig. 10 show the head unit working in line with two successive positions assumed by the insu-

lating glass panel that has moved, reducing the distance from the corner of the side of the cavity. It can be seen that the feeler pin is about to disengage.

[0054] The smoothing device is still inactive.

[0055] Fig. 11 shows the nozzle in line with the corner and the disengaged feeler pin has sent a command to the shaving/smoothing device to position itself against the outside edges of the glass panes of the insulating glass panel.

[0056] Fig. 12 shows the insulating glass in a locked position as regards horizontal movement and the head unit still locked as regards an upwards direction, but it can be seen that it has rotated around the corner; and the smoothing off device has moved a short distance resting on the outside of the sealing of the horizontal side.

[0057] Fig. 13 shows the head unit that has completed its rotation and the nozzle that is in the horizontal position with the nozzle mouth up against the cavity of the vertical side, while the insulating glass has maintained its previous position.

[0058] Fig. 14 shows the head unit in the initial stage of going up (or down) in control of the feeler pin which is resting on the outer back of the vertical side of the spacer frame. The shaving device is still inactive.

[0059] Figs. 15, 16, 17 and 18 show successive stages of the head unit moving vertically during the operation of the shaving device which, having reached the corner, gets ready to start the shaving of the vertical side.

[0060] Fig. 19 shows a successive stage where the shaving device has gone a short distance on the vertical sealing that has been carried out in order to complete the shaving procedure.

[0061] Examining figures 1 through 7 it can be seen that the machine is composed of bench 1 aligned with bench 2 with a space 12 between
where the head unit 11, 34 operates with a vertical upwards movement 10 and a descending movement 9.

[0062] On the side the two benches 1, 2 carry respectively the back 3 and the back 4 that respectively support the roller-carrier 7 bar 5 the and the roller-carrier 8 bar 6.

[0063] Bars 5 and 6 can be positioned on the respective backs 3, 4 varying the height if needed with reference to the height of the insulating glass 20.

[0064] The insulating glass panels 20 rest with a side 16 or 17 on the rollers 7, 8 of the bars 5 and 6 , said panels 20 having been loaded onto the guide blocks 14, 15 inclined by a few degrees with respect to the vertical.

[0065] The opposed guide blocks 14 and the guide blocks 15, which establish the width of the space where an insulating glass panel 20 is positioned, are always parallel to each other during their course, with the arrangement of the chains 12 and 14 holding them parallel in the vertical.

[0066] It follows that all the guide blocks that engage the side surfaces 16, 17 of the insulating glass panel 20 to be moved are placed parallel to said surfaces 16, 17 without any inclination that might cause dangerous irregular pressures.

[0067] The axes of the drums 21 and 22 of chains 12 and 14 are arranged horizontally.

[0068] In order to vary the width of the space established by the facing sides of the opposed guide blocks 14, 15 so as to adjust it to the thickness of the insulating glass to be sealed, the entire vertical structure, the one more on the outside with respect to the surface of the back 3, including the chain 12 with the guide blocks 14, the relative drums 21 and 22, the drive apparatus (pair of chain wheels 21, and relative positive drive belt 23) can be shifted transversally (keeping the same lie).

[0069] The shifting is carried out by the hydraulic jack 33 that acts on an arm of the lever 32 pivoted firmly on a rotating bar 29.

[0070] The moving of the end of the arm opposite that moved by the jack 33 is transmitted using a kinematic connection to the above-mentioned vertical structure.

[0071] The continual drive transmission to the block-bearing chain 12, in the various changes of position of the above-mentioned vertical structure examined earlier, is made possible because the wheel (not visible) that drives the drive belt 23 can move along the grooved section of the drive shaft 25 to which it is joined.

[0072] To synchronise the motion of the block-carrying 14, 15 chains 12, 13 with the block-carrying chains of bench 2 in alignment with bench 1, a connection is carried out (in space 12), using a positive drive belt 28, of the shaft 26 of bench 1 with shaft 27 of bench 2.

[0073] To obtain an identical shift of the mobile vertical structure of bench 1, described earlier, in order to vary the width of the space between the blocks of opposed chains, a connection is carried out (in space 12) using the bar 21, which joins the lever-carrying 32 bar 29 of bench 1 with the lever-carrying bar 30 of bench 2.

[0074] The head unit 11, 34 located in the space 12 between benches 1 and 2, which can be moved 10 vertically 9 (upwards and downwards) which is fitted with the feeler pin 38 that rests on the back of the spacer frame 18 that regulates the flow of sealant and stops the movement of either the insulating glass panel or the head unit 11, 34 and changes the orientation of the nozzle 39 to make it move vertically when the nozzle 39 is in line with a corner of the insulating glass panel 20.

[0075] An examination of figs. 8 to 19 shows that the innovative feature of this invention is composed of the device 35, 36 and 37 applied to the head unit 11, 34 which provides for the shaving off of the excess sealant left by the nozzle 39 during the filling of the cavity 29 at the corners of the insulating glass panel.

[0076] When the nozzle is operating and the feeler pin 38 is being used in the perimeter cavity 10 of the glass panel 19, the device 35, 36, 37 remains inactive.

[0077] When the feeler pin 38 comes out of the cavity 19 having gone beyond the corner of cavity 19 where it was being used, a command is sent to the shaving device 35, 36, 37 to start operating with the roller 36 resting an the outside lip of the panes 16, 17 of the glass, so that it starts to effectuate the shaving process, and the part of

the unit head 34 is made to rotate as soon as the nozzle has reached the corner.

[0078] Once the rotation of the head 34 has finished, the nozzle 39 has also assumed a new orientation and the feeler pin 39 is positioned inside the cavity of the new side. While the movement relative to the delivery nozzle 39 starts again, filling cavity 19, the roller 36 of the device continues the shaving of the previous part that had been started until it reaches the corner, to then carry on changing direction behind the corner for another stretch of the adjoining side.

[0079] What has been described earlier is the improvement made to the insulating glass sealing machine by the patent, which modified the plane of movement of the block-bearing chains from the horizontal to the vertical ensuring that the blocks grasp the surfaces of the outer panes of the insulating glass in a parallel manner without generating anomalous pressure and there is also the fact that the head unit, fitted with a nozzle delivery and a cavity depth feeler pin device fitted with rollers that press on the outside of the cavity along the preceding and successive stretch of the corner, carries out the shaving off of the excessive sealant left by the nozzle.

Claims

1. Improved machine for sealing insulating glass panes including two aligned benches (1, 2) with a spacing between them (12) each fitted with backs (3,4) fitted with bars (5, 6) having revolving rollers (7, 8) with a head assembly (10, 9, 11, 34) positioned in the spacing (12) which has a delivery nozzle (39) and a feeler pin, where the benches are fitted with block-carrying chains for moving the insulating glass panes (20) for the sealing of the perimeter cavity (19), **characterised by** the fact that the chains (12, 13) carrying the blocks (14, 15) are by nature vertical and the two chains are by nature parallel to each other.

2. Improved machine for sealing insulating glass panes according to claim 1 **characterised by** the fact that the blocks (14, 15) both of the lower horizontal section as well as the vertical sections of the chains and the upper horizontal section are arranged with the their surfaces facing the space they created, are parallel to each other and come into contact with the outside surfaces (16, 17) of the insulating glass panel (20) and are parallel to said surfaces.

3. Improved machine for sealing insulating glass panes according to claims 1 and 2 **characterised by** the fact that in order to vary the width of the space established by the opposed blocks (14, 15) of the two chains (12, 13) an entire vertical structure is moved (including a chain (12) with relative blocks (14) including relative drums that bear the chain (12) and including the motor part of the apparatus) by means of a hydraulic jack 33 and a cam lever 32 with two arms firmly pivoted on a revolving bar 29.

4. Improved machine for the sealing of insulating glass panes according to one or more of the preceding claims **characterised by** the fact that in order to achieve the synchronism of the movement of the chains of the machine's two benches (1, 2) the drive comes from a wheel (26) powered by the movement that drives the chains of one bench (1) by means of a belt (28) (positioned in the spacing (12)) that engages a chain wheel of the alignment bench (1) with the chain wheel with the same diameter (27) of the alignment bench (2) that drives the respective block-carrying chains.

5. Improved machine for the sealing of insulating glass panes including two alignment benches (1, 2) with spacing (12) each fitted with backs (3, 4) with bars (5, 6) fitted with rotating rollers (7, 8) with the head unit (10, 9, 11, 34) positioned in the spacing (12) with a delivery nozzle (39) and feeler pin (38) and with each bench equipped with block-carrying chains for moving the insulating glass panels (20) whose perimeter cavity (19) needs sealing, **characterised by** the fact that the head unit (11, 34) located in the spacing (12) between the two alignment benches (1, 2) can be moved (10) in the vertical (9) (upwards and downwards) in addition to being fitted with a feeler pin (38), which rests on the back of the spacer frame (18) and which establishes the regulation of the sealant flow and stops the movement either of the insulating glass (20) or of the head unit (11, 34) and changes the orientation of the sealant delivery nozzle (39) at the corners of the sides of the glass pane (20), said head unit also being fitted with the shaving device (35, 36, 37) for the excess sealant protruding from the cavity, left by the nozzle in the stage when it changes direction, which works along a short stretch of the perimeter of the insulating glass (20) that precedes a corner and which operates continuously by changing direction along a short stretch of glass that comes after the corner.

6. Improved machine for the sealing of insulating glass panes in accordance with the preceding claim **characterised by** the fact that the shaving of excess sealant is carried out by a roller (36) that is connected to the apparatus (35) by means of an angled rod (37) that forces it to rest on the outside of the cavity and travel short distances that come before and after a corner, and which is moved by the head unit (11, 34), the shaving device (35, 36, 37) being applied to said head unit (11, 34).

7. Improved machine for the sealing of insulating glass panes **characterised by** the fact that the shaving device (35, 36, 37) works in a coordinated manner

with the operations in the head unit (11, 34) using some of the same sensors (38) that are already present on the unit (11, 34).

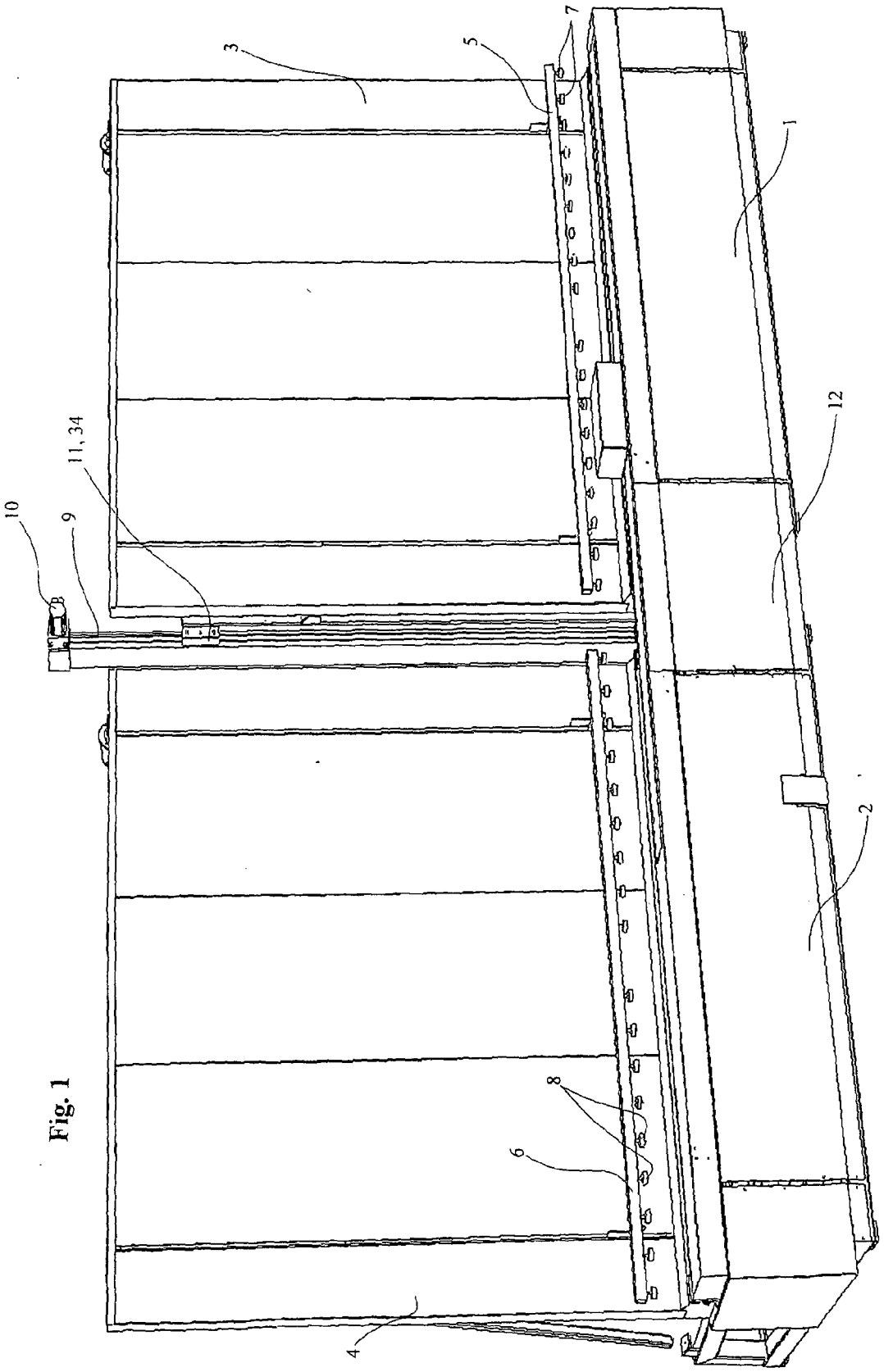


Fig. 1

Fig. 2

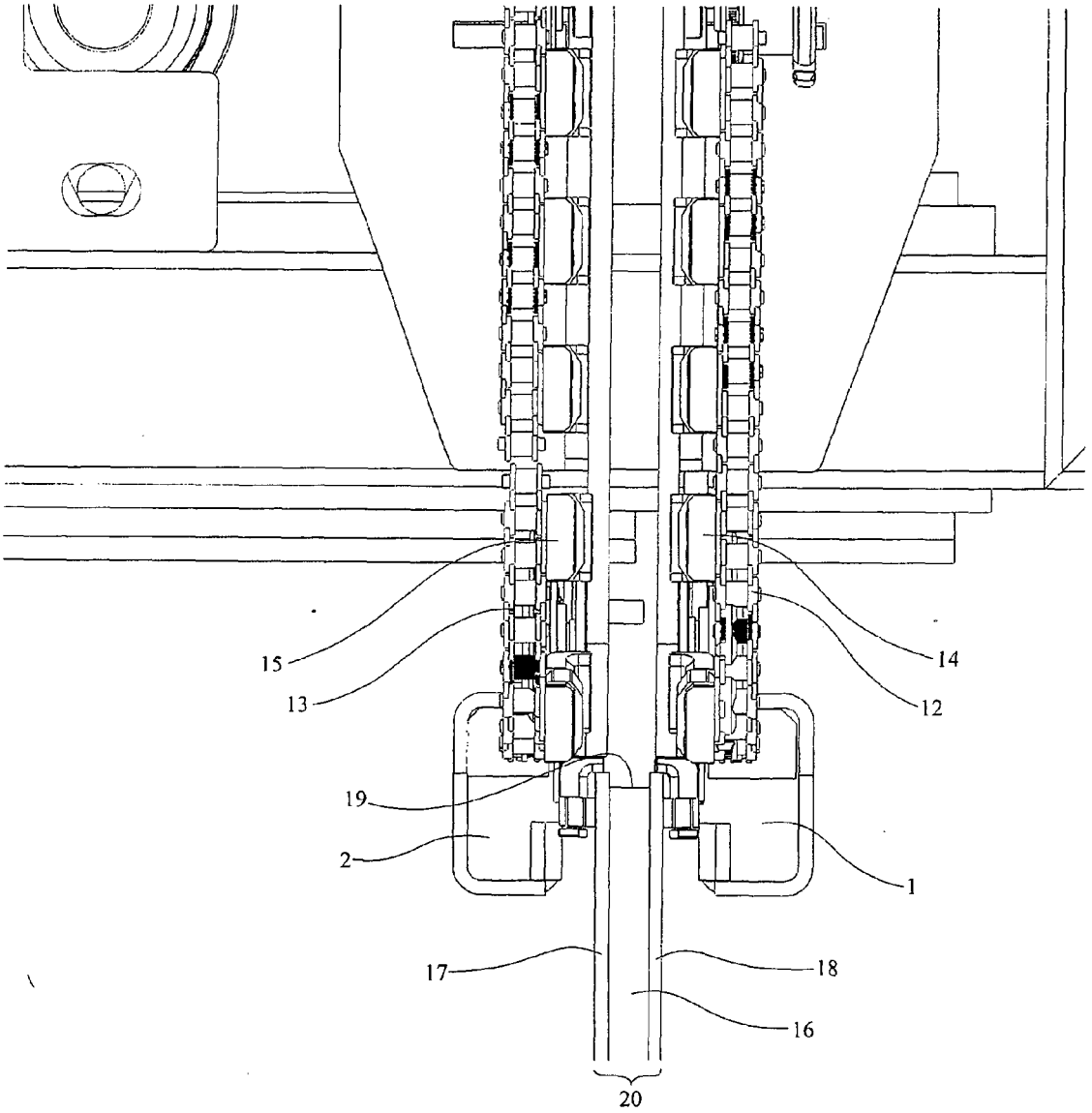


Fig. 3

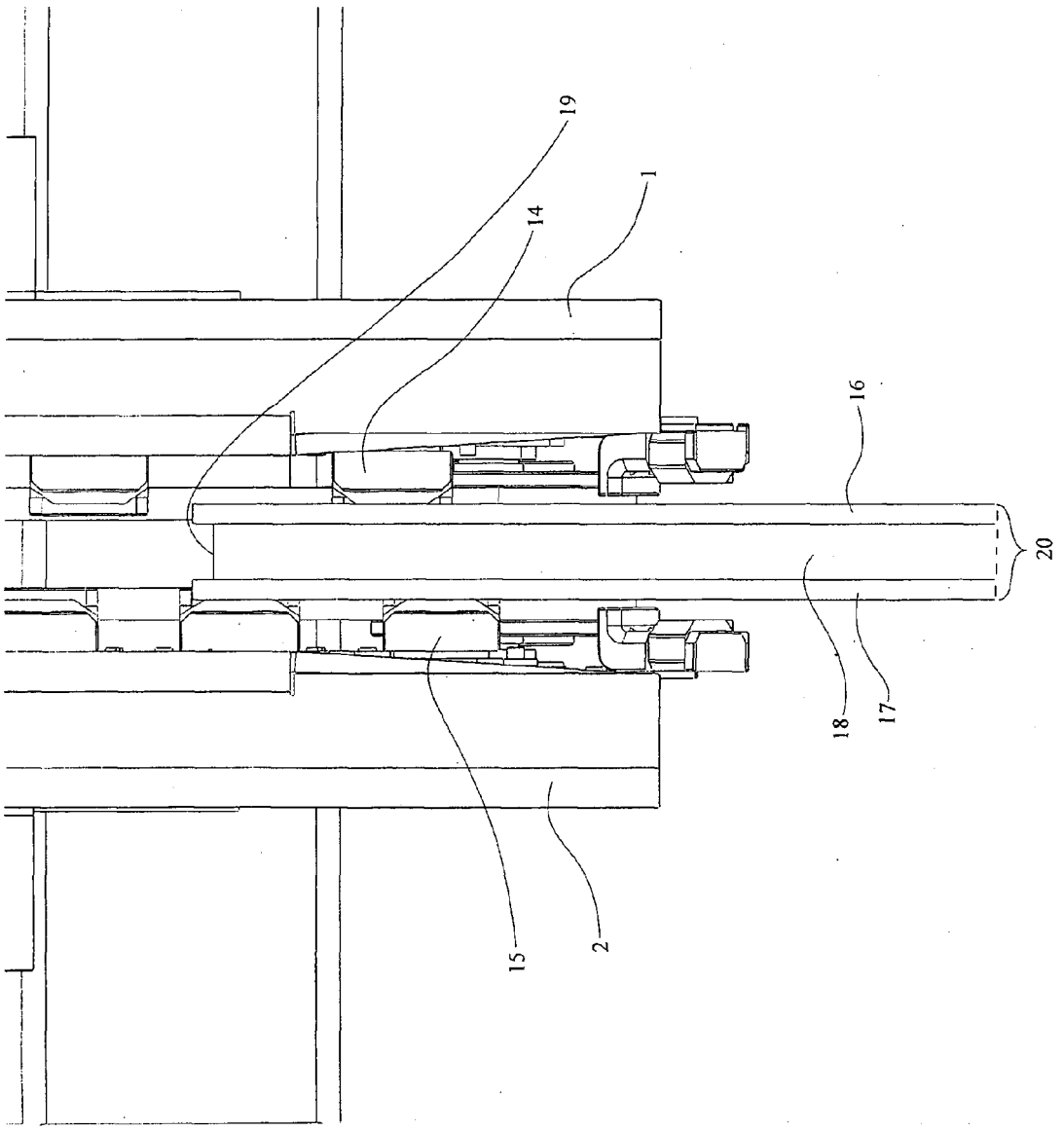
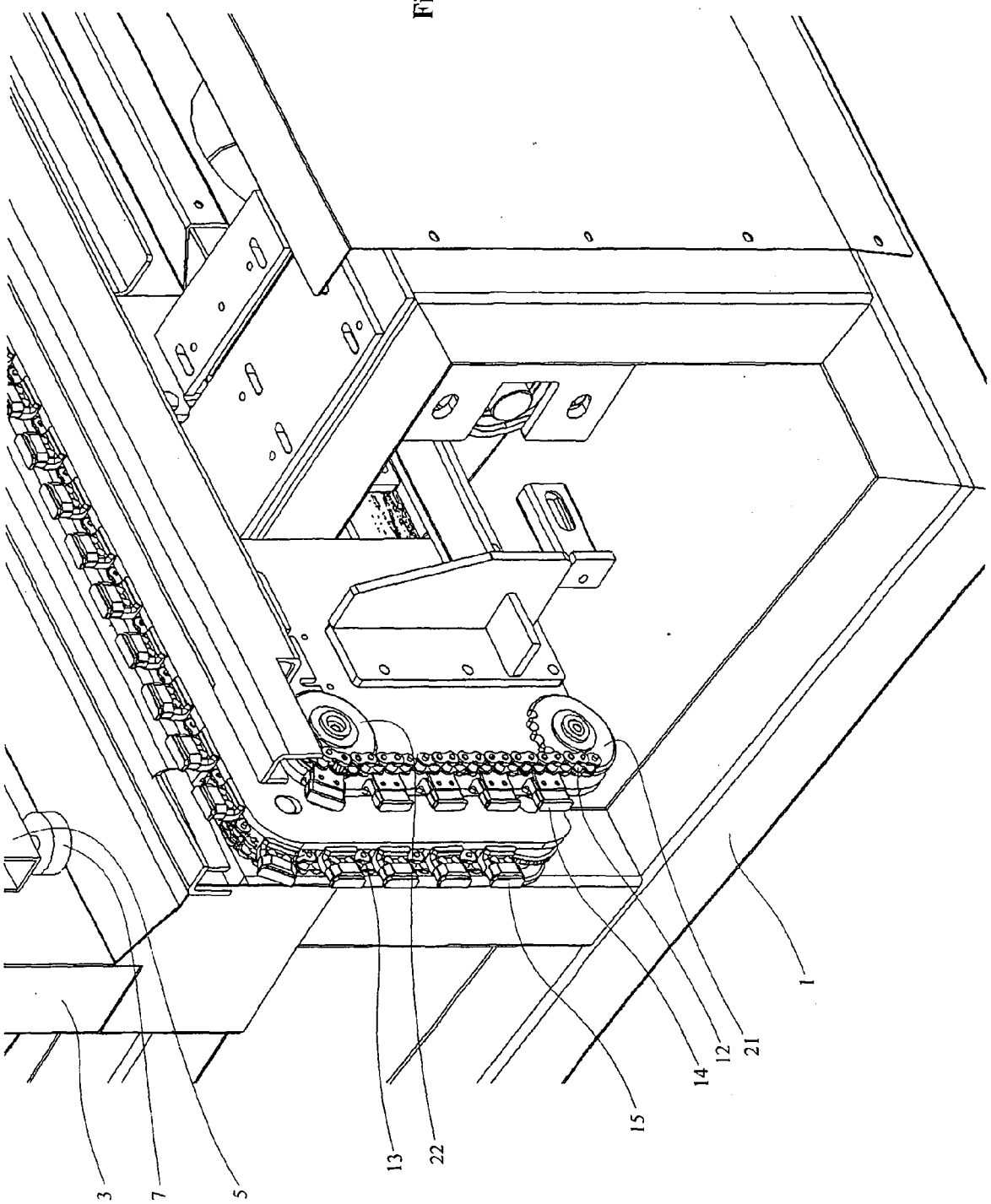


Fig. 4



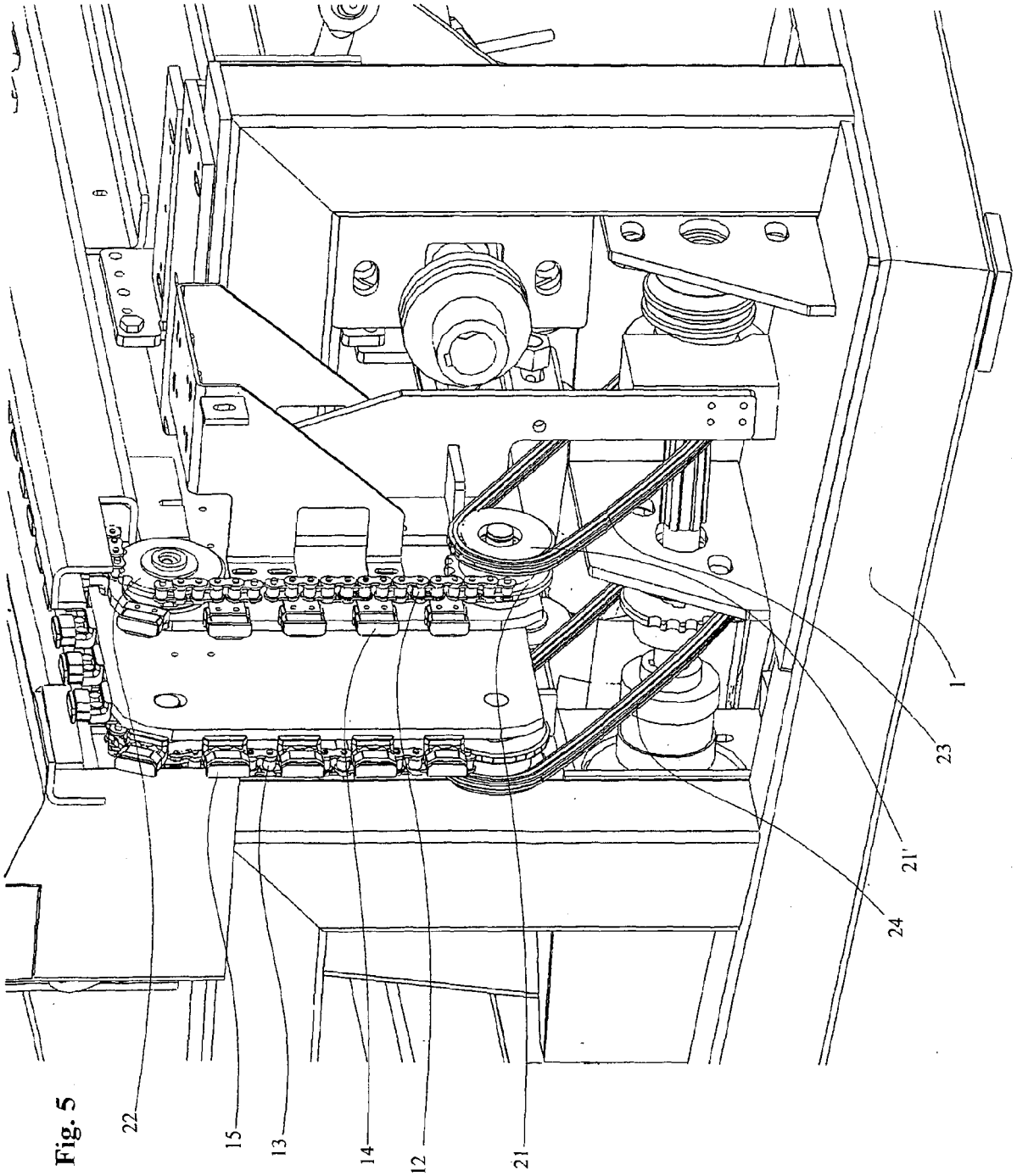


Fig. 5

Fig. 6

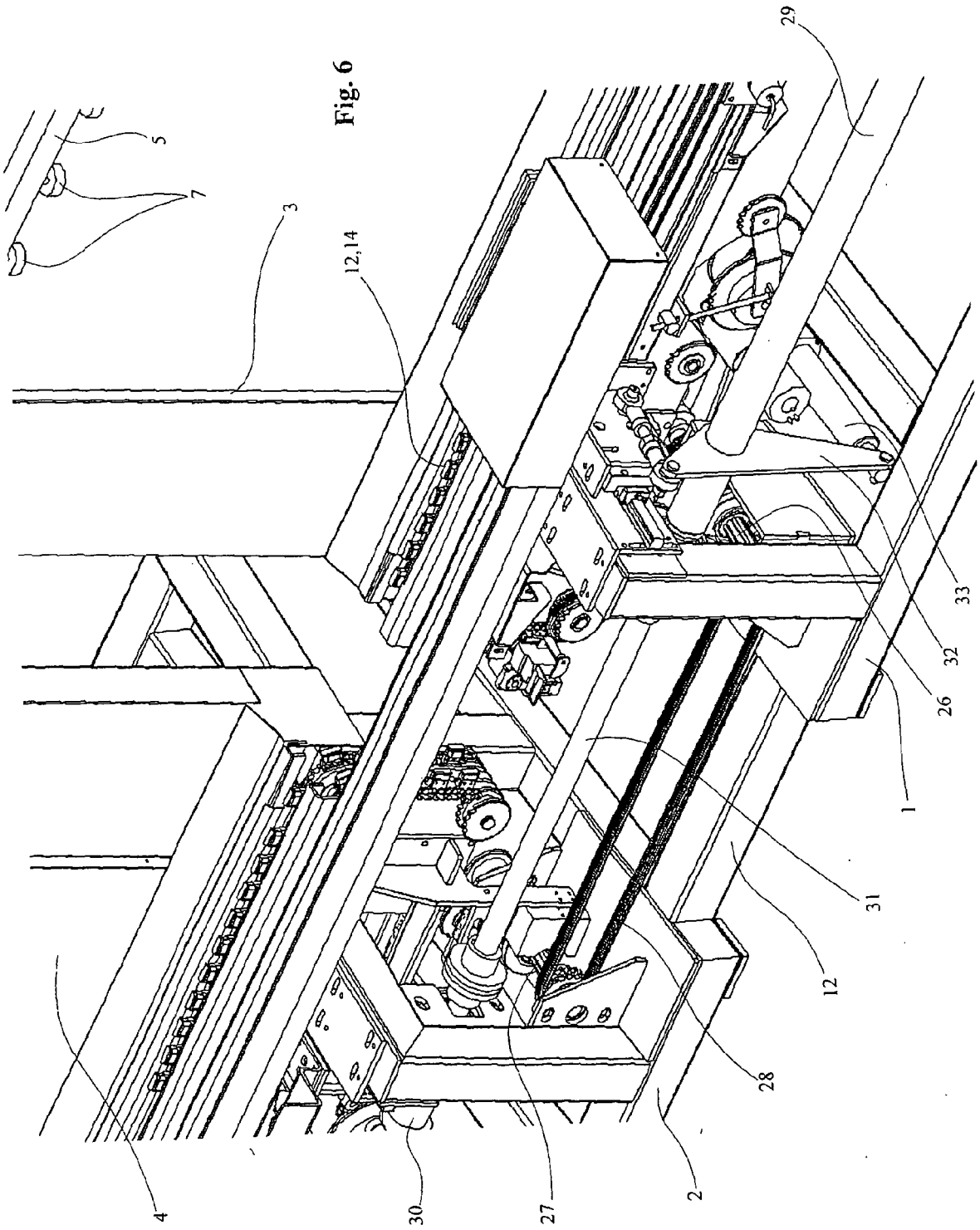
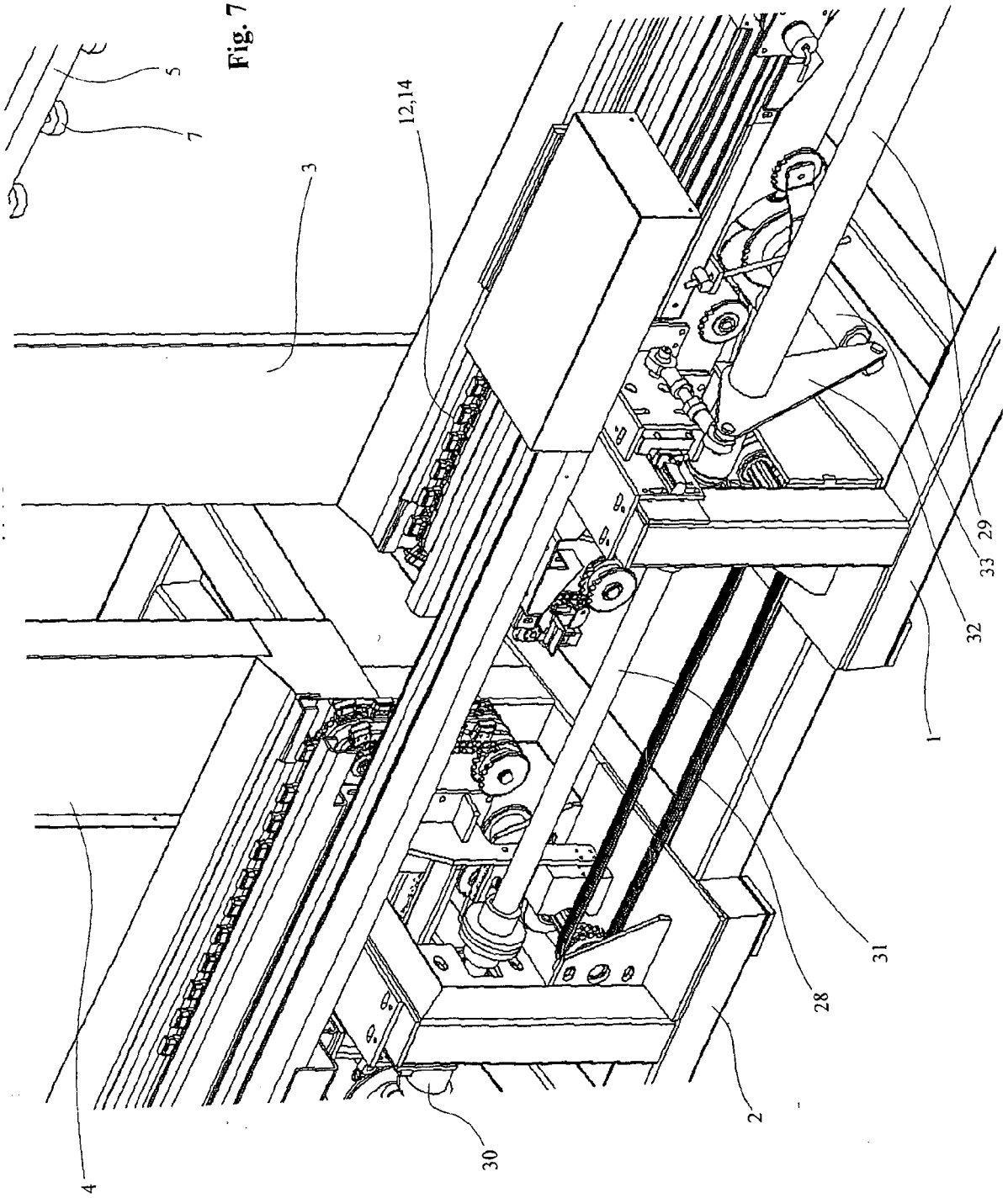


Fig. 7



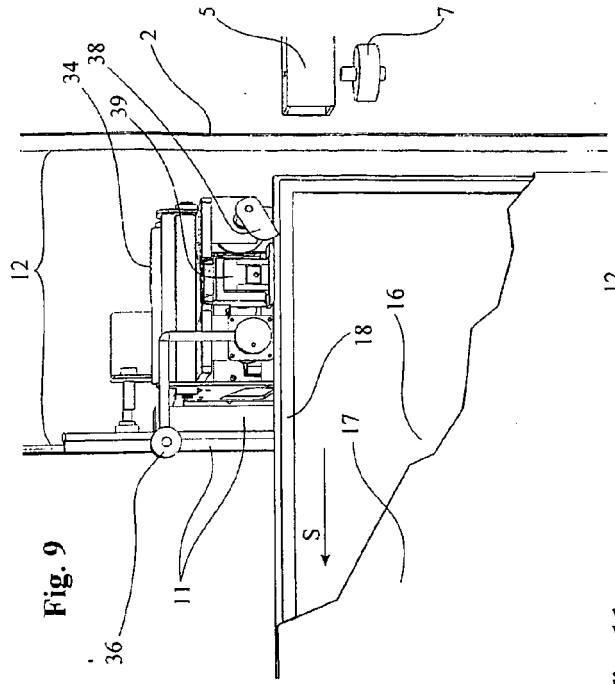


Fig. 9

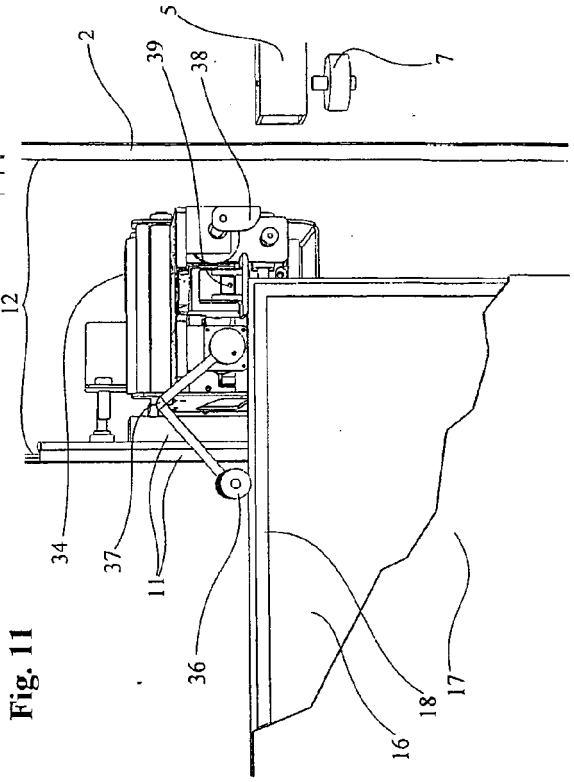


Fig. 11

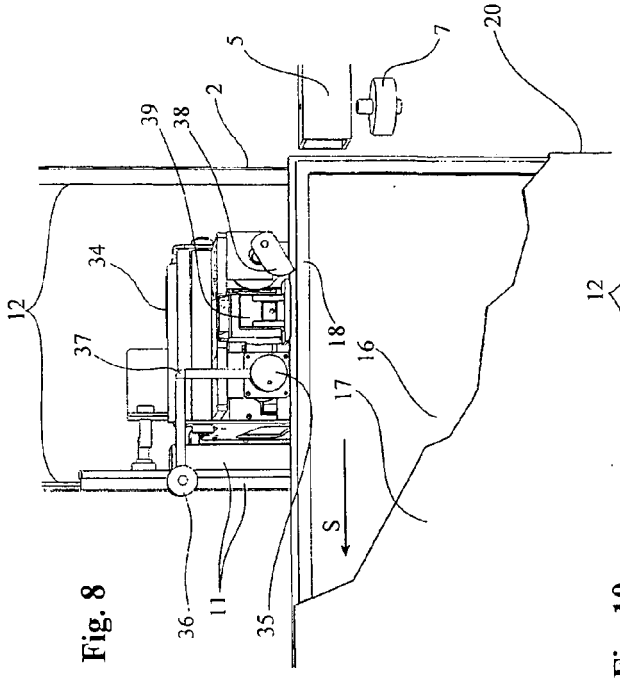


Fig. 8

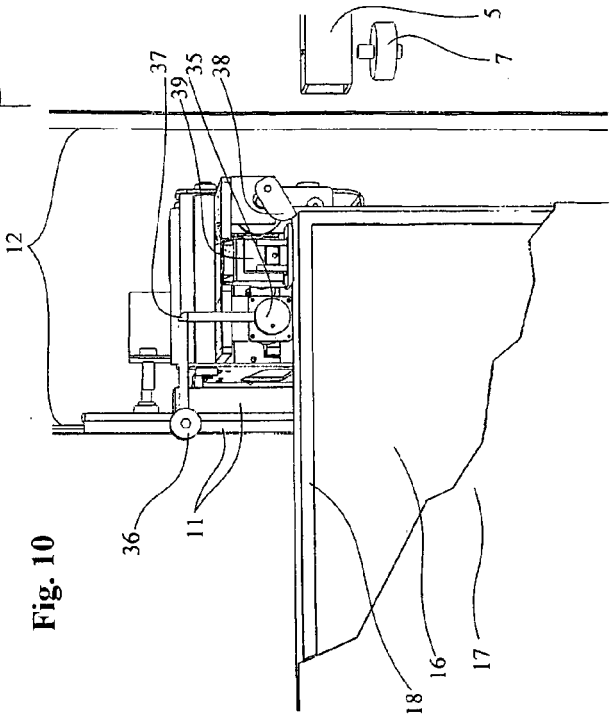


Fig. 10

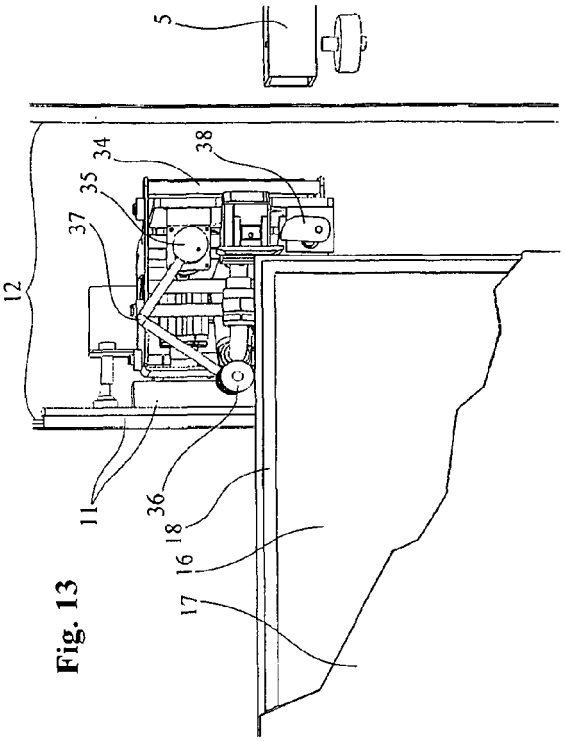


Fig. 13

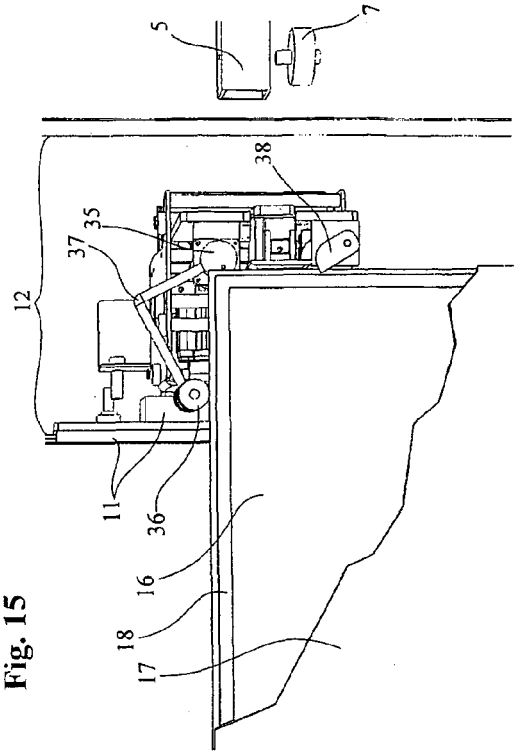


Fig. 15

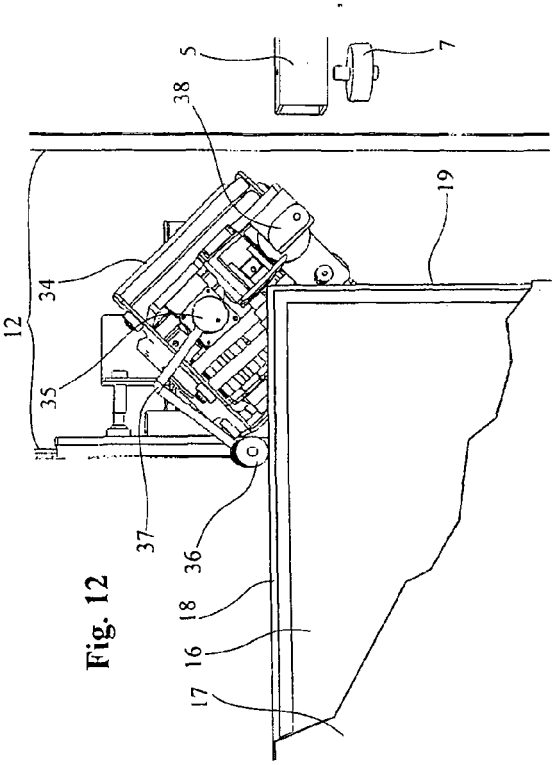


Fig. 12

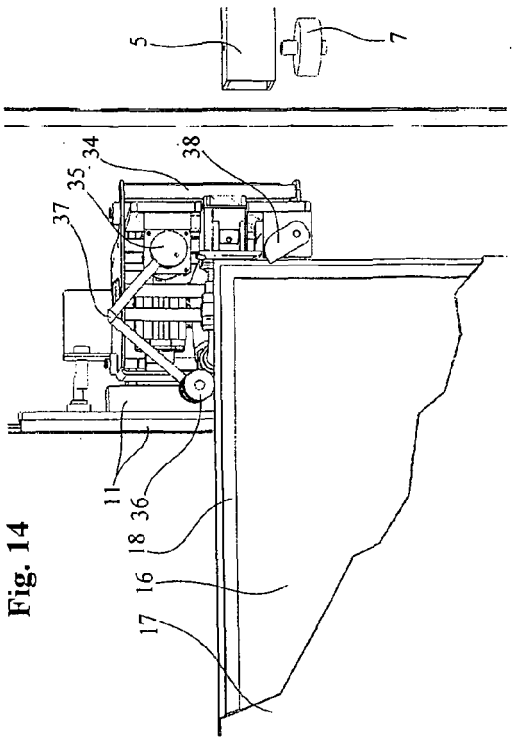


Fig. 14

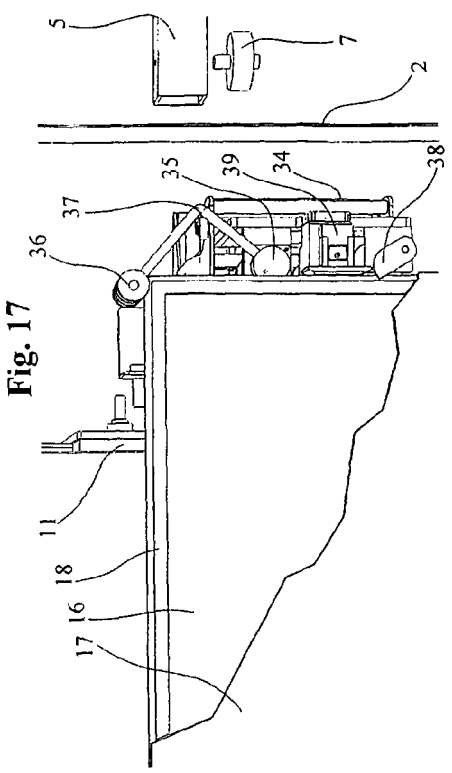


Fig. 17

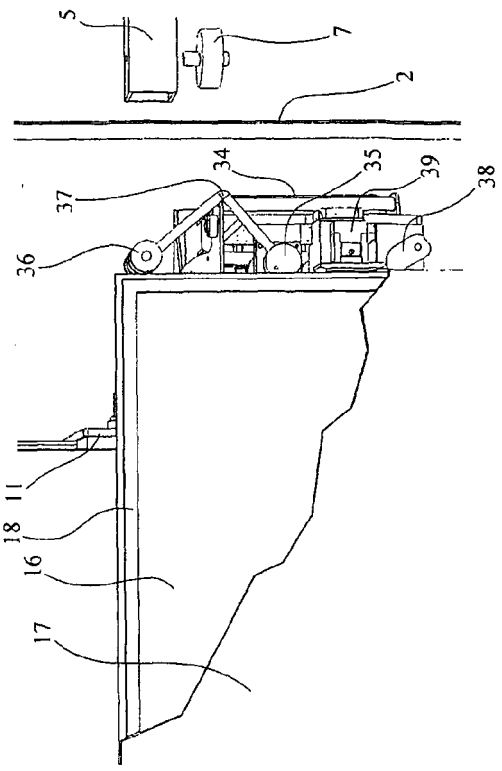


Fig. 19

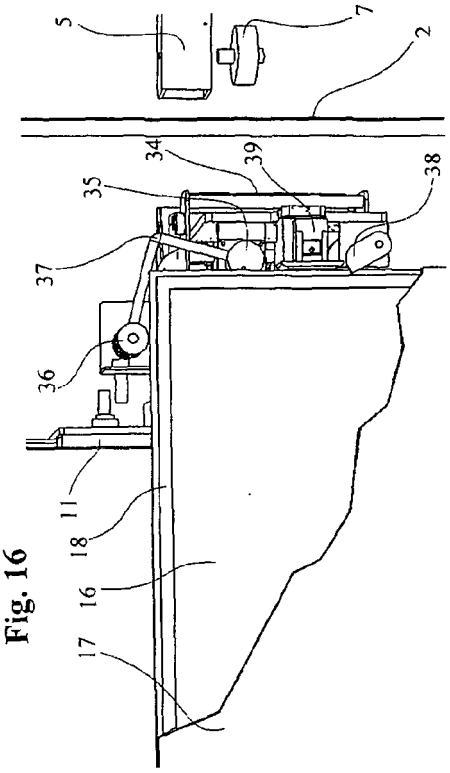


Fig. 16

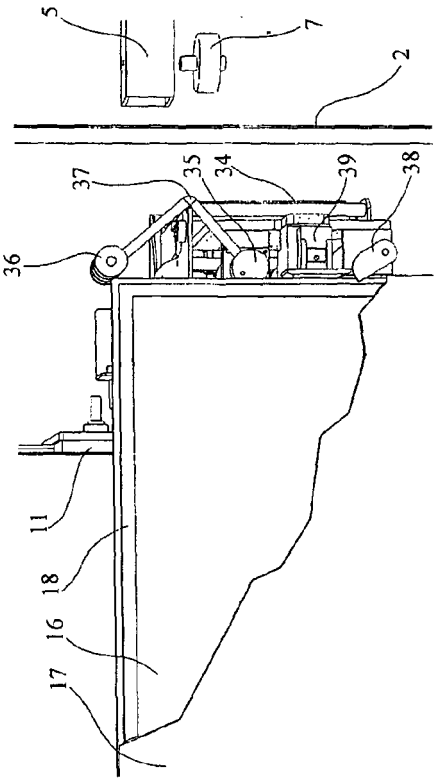


Fig. 18