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Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) System and method for the production of stacks of sheets of corrugated cardboard or the like

(57) The device includes: an inlet section (3), in which the sheets (F) are fed and disposed in a shingled arrangement, with a variable reciprocal degree of overlapping; a stacking station (31), in which predetermined quantities of sheets are stacked on a collection table (33) to form piles (P) of sheets (F); a series of conveyors (5, 9, 11, 13) to convey the sheets from the inlet section to the stacking station. The unloading end of the last conveyor (13) has an inclination adjustable as a function of the operating conditions of the device, to reduce the variation of the angle of incidence of the sheets with respect to the stacking table when said operating conditions vary.

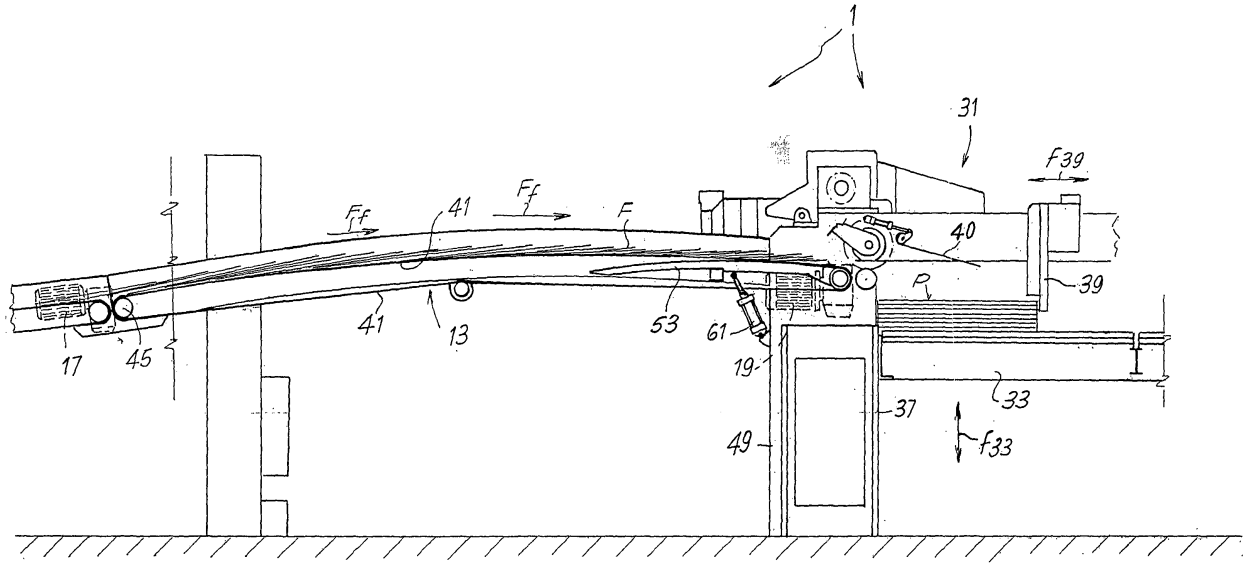

Fig.1A

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Description

Technical field

[0001] The present invention relates to systems for stacking sheets, for example sheets of corrugated cardboard or the like.

[0002] The invention also relates to a method for forming stacks or piles of sheets, in particular although not exclusively sheets of corrugated cardboard, fed continuously from a production line.

Prior art

[0003] The production of corrugated cardboard takes place by means of lines which operate continuously. Continuous webs of cardboard fed from reels being unwound are joined together, with a corrugated web interposed between two smooth sheets or webs, called facings. For technical reasons, the production of corrugated cardboard takes place at an essentially constant speed. A continuous web of corrugated cardboard is then scored and cut longitudinally into strips of the desired width corresponding to the width of the finished sheets to be obtained upon delivery from the production line. Each strip is also divided crosswise to obtain the individual sheets which are fed essentially continuously to the so-called stacker.

[0004] This section of the production line includes a first area, wherein the sheets are partly overlapped with one another, i.e. disposed with a shingled arrangement. The sheets thus arranged are fed along a series of conveyors, which can have a variable feed speed, to a collection table. This collection table is gradually lowered as the stack or pile of sheets forms thereon. Once the desired number of sheets has been reached on the single pile or stack, the latter must be moved away to free the table on which the subsequent stack forms.

[0005] This operation to remove the stack formed must not influence the feed speed of the web of corrugated cardboard and, consequently, the production speed of individual sheets. Therefore, in order to produce a temporary interruption in the flow of sheets reaching the stacking area, the speed of advance of the individual conveyor belts extending from the shingling area of the sheets to the stacking area is modified in a controlled way. The last sheets to be collected on a stack being completed are moved away from the sheets destined to form the start of the subsequent pile or stack due to the difference in speed of the sheets along the path defined by the conveyors. The sheets which slow down to produce this interruption in the flow are overlapped with one another to a greater extent, so that the same quantity of sheets per unit of time are essentially fed to the stacker, while at the exit side of the first section of the stacker (where the sheets are disposed in a shingled arrangement) towards the conveyors which convey the sheets to the stacking area, the sheets are slowed down and overlapped with one another to a greater extent. This transient phase ceases when the stack or pile formed has been removed and the stacking table has been returned to the correct height to receive the first sheets of the subsequent stack.

[0006] Various systems have been produced to perform these operations, differing for example in the sequence of speeds set on the conveyors, in the means to retain the sheets, in the variation in the degree of shingling of sheets and in other specific characteristics known to those skilled in the art.

[0007] For example, US-A-5,415,389 describes a system in which the sheets destined to form the new pile or stack are slowed down and lifted from the conveyor below by means of a gripper which travels along the feed path of the sheets. For this purpose, the gripper is mounted on a carriage or slide controlled with an alternate movement. A further system which uses a movable gripper to control sheets is described in US-A-5,829,951.

[0008] US-A-4,200,276 describes a different sheet shingling and stacking system.

[0009] US-A-4,313,600 describes a stacker in which the series of sheets destined to form a new pile is temporarily slowed down and controlled by a chain conveyor device which raises the sheets making them advance more slowly with respect to the feed speed of the conveyor belt below, which finishes feeding the last sheets to the nearly completed pile.

[0010] EP-A-0427324 describes another stacker in which variable speeds of conveyors in line allow the gap in the flow of sheets during the transient phase to complete a pile and start forming the subsequent pile.

[0011] US-A-4,273,325 describes a stacker for sheets of corrugated cardboard characterized by a particular arrangement of the members to control the sheets unloaded from the series of conveyor belts onto the pile being formed.

[0012] US-A-4,598,901 describes a stacker characterized by a particular arrangement of the members which perform shingling of the sheets, i.e., which positions them in a partially overlapped arrangement to feed them on the series of conveyors that unload the sheets onto the pile.

[0013] A further example of a device to perform shingling of sheets is described in US-A-4,776,577.

[0014] Further examples of stackers are described in US-A-4,188,861; DE-AS-1148437; EP-A-0802025; US-A-3,834,288; US-A-4,040,618; US-A-3,938,674; US-A-3,995,540; US-A-4,133,523.

[0015] The type of speed sequence and of mechanisms used to obtain the variation in shingling of the sheets during the transient phase to remove a pile or stack and start forming the subsequent stack does not represent a specific aspect of the present invention, as said invention can be applied to any type of stacker in which a variation in the degree of shingling in the transient phase is required.

[0016] To obtain correct stacking of the sheets, pre-

venting slippage of said sheets when they are unloaded from the conveyor belts onto the pile or stack being formed, owing for example to the cushion of air forming between the upper surface of the stack and the lower surface of the sheet being unloaded onto said stack, it is necessary for sheets unloaded from the last conveyor belt onto the pile being formed to have a specific angle with respect to the horizontal, i.e. with respect to the upper surface of the pile. For this purpose the unloading angle of the last conveyor belt is chosen specifically, to unload the sheets correctly onto the pile or stack.

[0017] Nonetheless, once the unloading angle of the last conveyor of the stacker has been set, the effective angle of incidence with which the sheet is unloaded onto the pile being formed also depends on the degree of shingling, i.e. on the greater or lesser reciprocal overlapping of the sheets on the conveyors. This means that in the transient phase in which sheets are overlapped to a greater extent with one another on the feed path to the stacking area, the angle of incidence with which the sheets are unloaded on the pile no longer coincides with the optimal angle chosen when designing the stacker and defined by the inclination of the final section of the last conveyor belt.

[0018] Consequently, there is a risk of slippage of the sheets at least in the initial transient phase to form a pile or stack.

Objects and summary of the invention

[0019] The object of the present invention is to produce a stacking device, which eliminates or at least reduces the aforesaid drawbacks and makes stacking of the sheets more uniform even in the transient phases, when the degree of overlapping, i.e. of shingling of the sheets, varies with respect to the condition of overlapping at normal operating speed.

[0020] This and further objects and advantages, which will be apparent to those skilled in the art from reading the text hereunder, are in substance obtained with a device including: an inlet section, in which the sheets are fed and disposed in a shingled arrangement, with a variable degree of reciprocal overlapping; a stacking station, in which predetermined quantities of sheets are stacked on a collection table to form piles of sheets; a series of conveyors to convey the sheets from said inlet section to said stacking station. Characteristically, the unloading end of the last conveyor of said series has an inclination adjustable as a function of the operating conditions of the device, to reduce the variation of the angle of incidence of the sheets with respect to the stacking table when said operating conditions vary, and in particular when the degree of shingling, i.e. of reciprocal overlapping, of the sheets varies.

[0021] In practice, with a device of this type it is possible to modify the arrangement, i.e. the position, of the end section of the last conveyor so that the angle of incidence of the sheets which are unloaded onto the pile being formed by said conveyor does not undergo excessive variations with respect to an optimal angle when there is a variation in the operating conditions of the stacking system, and in particular when there is a variation in the degree of shingling, i.e. overlapping, of the individual sheets.

[0022] In substance, according to the invention the stacker is designed so that the conveyor has an optimal form and position for unloading of the sheets with the chosen angle of incidence in normal operating conditions. When, on the other hand, during the transient phase to remove the completed pile, it is necessary to produce a gap in the flow of sheets on the series of conveyors, with a consequent increase in the degree of reciprocal overlapping of the sheets, the invention allows the configuration of the last conveyor to be adjusted to correct - by reducing it - the variation of the angle of incidence with which the sheets are unloaded onto the pile due to this varied condition of reciprocal overlapping of the sheets. The correction can be made continuously as a function of the degree of overlapping of the sheets, or two or more predetermined positions can be provided as a function of the degree of overlapping, with stepped adjustment.

[0023] Using one of the known systems to check the flow of sheets by means of variation of the degree of shingling and variation of the feed speed of the individual conveyors, the control unit of the stacker can know, at all times, the degree of overlapping of the sheets in the unloading area from the last conveyor onto the pile being formed. With this information it is possible to control the arrangement of the final conveyor, i.e. the unloading conveyor. Alternatively, it would also be possible to provide sensor means, such as optical sensors, which detect the position of the sheets (in particular the thickness of the sheets which varies with the degree of shingling) in the unloading area from the conveyor, with control of the arrangement of the last conveyor on the basis of the signals coming from these sensors.

[0024] According to a possible embodiment of the invention, the last conveyor includes, in a way known per se, a continuous flexible member (such as a belt) sliding on a supporting surface. According to the invention the supporting surface, which can be produced with an elastically deformable plate, has a variable conformation to modify the configuration of said flexible member.

[0025] Advantageously, to maintain control of the belt or other flexible member, a guide channel can be provided on the supporting surface, inside which said flexible member engages, for example by means of a longitudinal projection or edge. To maintain flexibility and, consequently, the capacity for elastic deformation of the supporting surface, the guide channel can be produced in an area of the sheet forming the supporting surface which is provided with a series of slots aligned along the direction of advance of the flexible member. These slots allow the plate to deform elastically notwithstanding the presence of bends to form the channel.

[0026] To obtain deformation of the plate or other mechanical element forming the supporting surface for the flexible member forming the last conveyor of the stacker, it is advantageous to provide a movable support which acts on the deformable supporting surface on the opposite face from the one on which the flexible member slides. The movable support can include a series of elongated elements according to the direction of advance of the flexible member. These elongated elements can be integral with one another so that a single actuator can control the movement of all the elongated elements, although it would also be possible to use elements separate from one another. The movable support advantageously has a curved supporting surface against which, as a consequence of lifting of the support, the supporting and sliding surface of the flexible member of the conveyor is deformed.

[0027] According to an advantageous embodiment of the invention, the movable support can be oscillating about a transverse axis with respect to the direction of advance of the flexible member. Advantageously, for improved control of the angle at which the sheets are delivered from the last conveyor of the stacker, the axis of oscillation of the movable support is placed in close proximity to, or coinciding with, the axis of rotation of a delivery roller of the sheets, disposed downstream of the last conveyor with respect to the direction of advance of said sheets.

[0028] Further and advantageous characteristics and embodiments of the device according to the invention are indicated in the appended claims and will be better described with reference to a particularly advantageous and currently preferred embodiment of the invention.

[0029] According to a different aspect, the invention also relates to a method to form piles of sheets fed continuously, wherein: a flow of partly overlapped sheets with a variable degree of shingling is formed on a series of conveyors; said sheets are accumulated on a stacking table to form piles of a predetermined number of sheets; by varying the degree of shingling of said sheets, a gap is produced in the flow to allow one pile to be removed and to start forming the subsequent pile. Characteristically, the method according to the invention also includes the phase to modify the unloading angle of the last of said conveyors as a function of the conditions in which said sheets are conveyed, to reduce the variation of the angle of incidence of the sheets with respect to the stacking table when the operating conditions vary, and in particular when the degree of shingling varies.

Brief description of the drawings

[0030] The invention shall be better understood by following the description and accompanying drawing, which shows non-limiting examples of embodiments of the invention. More specifically, in the drawing:

Figures 1A and 1 B show a side view of a stacker to which the invention is applied;

Figures 2 and 3 show the end portion of the last conveyor and the area for unloading the sheets and forming the pile or stack, in two different arrangements of the conveyor;

Figure 4 shows a plan view according to IV-IV in Figure 3;

Figure 5 shows a local section according to V-V in Figure 3;

Figure 6 shows an enlarged detail of the part indicated with VI in Figure 2.

Detailed description of a preferred embodiment of the invention

[0031] Figure 1 shows in a side view a stacker, indicated as a whole with 1, to which the present invention is applied. As a whole the stacker 1 is produced according to the description in US patent no. 5,415,389, which can be referred to for greater details of operation thereof, and therefore is not described in detail herein.

[0032] The stacker 1 has an inlet section 3, in which sheets F of corrugated cardboard, coming from a forming line, not shown, are partially overlapped with one another with a degree of overlapping (shingling) which can vary during the forming cycle of an individual pile of sheets. The inlet section has a conveyor 5 operated by a geared motor 7. Disposed downstream of the conveyor 5 is a series of further conveyors 9, 11 and 13, each of which includes, for example, a belt or other continuous flexible member. The conveyors 9, 11 and 13 are operated by respective geared motors 15, 17 and 19. Associated with the conveyor 9 is a carriage 21, mounted on which is a gripper 23, operated by a piston-cylinder actuator 25, which engages the first sheets of a series of sheets F destined to form a new pile in the stacking area.

[0033] Operation of the gripper 23 and of the conveyors 5, 9, 11 and 13 is described in the aforesaid US patent no. 5,415,389 and will not be described herein in greater detail. It suffice to mention that the individual sheets are fed to the section 3 at an essentially constant speed, while upon delivery from the last conveyor 13 there must be intervals of time during which no sheet is unloaded, to allow removal of a formed pile and repositioning of the storage table at the correct height to start stacking the first sheets of a subsequent pile. In fact, the stacking station, indicated as a whole with 31, is provided with a table 33 movable vertically according to the double arrow f33 along vertical guides 37. The stacking table 33 must be at a distance that allows the sheets coming from the last conveyor 13 to accumulate thereon correctly, being stopped by a stop 39 which is adjustable according to the double arrow f39 as a function of the longitudinal dimension of the sheets F. Therefore, as the pile forms the table 33 is lowered gradually.

[0034] When a pile has been completed on the table 33 and it is in the lower position thereof, the pile must be removed and the table 33 returned to the height to start

forming the subsequent pile. This operation requires some seconds during which flow of the sheets F is interrupted on the series of conveyors 9, 11 and 13. This gap is also obtained by increasing the degree of reciprocal overlapping of the first sheets destined for the new pile or stack being formed and with this increasing the overall thickness of the sheets laid on the conveyors 5 - 13.

[0035] Figure 2 shows the end portion of the last conveyor 13, on which sheets F are overlapped to a greater extent, typical of the transient phase which follows unloading of a completed pile P. As can be seen in Figure 2, the first sheet F1 which is unloaded from the conveyor 13 onto the horizontal surface defined by the sheet F2 previously unloaded on the pile being formed is not optimal: the sheet F is inclined upwards thereby favoring "floating" of said sheet on the cushion of air which forms between the sheets F1 and F2. This cushion of air causes the risk of the sheet F1 slipping to the side and consequently, of an untidy pile being formed of sheets which are not perfectly aligned. This phenomenon is not controlled adequately even if brushes 40 (know per se) are provided to push the sheets F1, unloaded in sequence from the conveyor 13, downwards.

[0036] To avoid the phenomenon of slippage of the sheets, the correct position in which the sheets F must be unloaded from the conveyor 13 is the one illustrated in Figure 3, with the first sheet F1 horizontal or preferably inclined downwards with a slight inclination in the order of 4° with respect to the horizontal. In substance, the front edge of the sheet F1 points downwards. This greatly reduces the tendency of the sheet F1 to "float" on the cushion of air which can form between the sheets F1 and F2. On the other hand, in normal operating conditions, i.e. outside the transient phase to unload a formed pile and start forming the subsequent pile, the arrangement of the conveyor 13 represented in Figure 3 would lead to an excessively high angle of incidence of the sheet F1. This is because in normal operating conditions, distant from the transient phases, the sheets F disposed on the conveyor 13 are overlapped with one another to a much lesser degree and therefore the overall thickness of the sheets disposed on the conveyor is inferior. The optimal arrangement of the conveyor 13 in operating conditions outside the transient phase is the one shown in Figure 2.

[0037] The invention provides for modifcation of the configuration of the end part of the conveyor 13 from the arrangement in Figure 2 to the arrangement in Figure 3 and vice versa as a function of the operating conditions of the stacker 1. In practice, in the transient phases the conveyor 13 will have the configuration in Figure 3, while in the normal operating phases said conveyor will have the configuration in Figure 2.

[0038] The members to modify the arrangement, i.e. the conformation of the end portion of the conveyor 13 will be described in greater detail hereunder with reference in particular to Figures 2 to 6.

[0039] In practice, the conveyor 13 includes a continuous flexible member, typically a belt 41, driven around a motorized end roller 43, and around an idle roller 45 (Figure 1) disposed upstream. The upper section of the conveyor strip or belt 41 is guided on supporting and sliding surfaces formed by suitably shaped plates. The last of these supporting surfaces is formed in part by a plate 45, the form and position of which is modified according to the operating conditions of the stacker 1 to pass from the arrangement in Figure 2 to the arrangement in Figure 3 and vice versa.

[0040] The plate 45 is fastened with the back edge 45A thereof to a fixed transverse crosspiece 47, integral with the load-bearing structure 49, which is also provided with sides 51 to contain the sheets F. The front edge 45B of the plate 45 is connected, by means of an arrangement of brackets 45C (Figure 6), pins 45D and slots 51, to elongated supporting elements 53. These elongated elements (see also Figure 4) extend in the direction of movement of the conveyor 13 and have free ends 53A oriented towards the area from which the sheets F are fed. The individual elements 53 are connected to one another by means of a first crosspiece 55 and a second crosspiece 57, so as to form a single support for the plate 45. The support formed of the elongated elements 53 and of the crosspieces 55, 57 is hinged about the axis A-A of rotation of a roller 59 to unload the sheets onto the table 33 on which the pile of sheets P forms. The support 53, 55, 57 oscillates about the axis A-A controlled by a piston-cylinder actuator 61, the rod of which is hinged in 63 to the support and in 65 to the fixed structure 49.

[0041] The elongated elements 53 have a curved profile with the convexity facing upward, forming a curved supporting surface for the plate 45. Consequently, as can be seen by comparing Figures 2 and 3, by raising the support 53, 55, 57 with an oscillating movement in a clockwise direction about the axis A-A, the extrados (i.e. the convex surface) of the elongated elements 53 presses against the lower surface of the plate 45 to cause bending, i.e. an upward curvature. Coupling by means of pin and slot (51, 45C, 45D) with the backlash that this allows, facilitates deformation of the plate 45.

[0042] In an alternate position with respect to the elongated elements 53, integral with the fixed structure 49 are elongated section bars 67, forming fixed supports for the plate 45. The fixed supports 67 are carried by the crosspiece 47 and by a further crosspiece 69.

[0043] The final section of the upper branch of the conveyor 13 is supported, downstream of the front edge 45B of the plate with variable arrangement 45, by a further supporting plate 71, preferably flat, connected rigidly to the elongated elements 53 and to the crosspiece 57. While the plate 45 is arched, i.e. deformed as a consequence of raising of the supports 53 when the conveyor 13 changes from the arrangement in Figure 2 to the arrangement in Figure 3, the plate downstream 71 remains essentially flat, with modification only of the angle with respect to the horizontal. Inclination of the plate 71 defines the unloading angle of the sheets F from the conveyor 13 onto the table for storage and formation of the

pile P.

[0044] The motorized drive roller 43 of the strip or belt 41 is supported by the arched end supporting elements 53, i.e. the outermost ones, so as to move therewith under the thrust of the piston-cylinder actuator 61. The geared motor 19 is, on the other hand, supported by the fixed structure 49. Motion is transmitted (see Figure 4) by means of a constant velocity joint 20. The roller 59 for unloading or delivery of the sheets from the conveyor 13 is made to rotate by means of the same geared motor 19 through a chain drive 60 and remains fixed in space when the supports 53 oscillate, changing from the arrangement in Figure 2 to the arrangement in Figure 3 or vice versa, as this movement is a movement of oscillation about the axis A-A of said roller.

[0045] Also represented in Figures 2 and 3 are an upper idle roller 81 which rests, oscillating about an axis B, on the upper surface of the assembly of sheets F fed from the conveyor 13. The brush 40 is associated with the oscillating arm (indicated with 82) which supports the idle roller 81.

[0046] To guide the belt 41 along the surface formed by the plate 45 and by the plate 71, the belt has longitudinal projections, one of which is indicated schematically with 41A in Figure 5. The two projections, which are in proximity to the longitudinal edges of the belt 41, are guided in corresponding channels 45E and 71 E formed by the plate 45 and by the plate 71, which for this purpose are suitably folded along longitudinal folding lines. To maintain the flexibility of the plate 45 it has a series of slots produced aligned with one another at the level of the channels 45E, which are in practice formed of sections of folded plate separated from one another by empty spaces.

[0047] It is understood that the drawing shows one an example provided purely as a practical embodiment of the invention, which may vary in shapes and arrangements without however departing from the scope of the concept on which the invention is based. Any reference numbers in the appended claims are provided for the purpose of facilitating the reading thereof, with reference to the description and to the drawing and do not limit the scope of protection represented by the claims.

Claims

1. A device for stacking sheets of cardboard or the like, including:

   - an inlet section, in which the sheets are fed and disposed in a shingled arrangement, with a variable reciprocal degree of overlapping;
   - a stacking station, in which predetermined quantities of sheets are stacked on a collection table to form piles of sheets;
   - a series of conveyors to convey the sheets from said inlet section to said stacking station;

   characterized in that at least the unloading end of the last conveyor of said series has an inclination adjustable as a function of the operating conditions of the device, to reduce the variation of the angle of incidence of the sheets with respect to the stacking table when said operating conditions vary.

2. Device as claimed in claim 1, **characterized in that** it includes a control unit, programmed to regulate said inclination as a function of the degree of shingling of the sheets being fed along said series of conveyors.

3. Device as claimed in claim 1 or 2, **characterized in that** said last conveyor includes a continuous flexible member, sliding on a supporting surface, said supporting surface having a variable conformation to modify the configuration of said flexible member.

4. Device as claimed in claim 3, **characterized in that** said supporting surface is formed by an elastically deformable plate.

5. Device as claimed in claim 3 or 4, **characterized in that** said supporting surface includes at least a guide channel for said flexible member.

6. Device as claimed in claim 5, **characterized in that** said supporting surface is formed by a folded plate to define said guide channel, which has a plurality of slots aligned along the direction of advance of said sheets, to maintain the flexibility of said plate.

7. Device as claimed in one or more of claims 3 to 6, **characterized in that** disposed under said supporting surface with variable conformation is a movable support, which acts on said surface from the opposite side to the side on which said flexible member slides.

8. Device as claimed in claim 7, **characterized in that** said movable support includes a series of elongated elements, oriented according to the direction of advance of said flexible member.

9. Device as claimed in claim 8, **characterized in that** said elongated elements are integral with one another.

10. Device as claimed in one or more of claims 7 to 9, **characterized in that** said movable support has a curved supporting surface, against which the sliding surface of the flexible member of the conveyor is deformed.

11. Device as claimed in one or more of claims 7 to 10, **characterized in that** said movable support oscillates about an axis transverse with respect to the direction of advance of said flexible member.

12. Device as claimed in claim 11, **characterized in that** said support oscillates about an axis of rotation of a delivery roller of the sheets, disposed downstream of the last conveyor with respect to the direction of advance of the sheets.

13. Device as claimed in one or more of claims 7 to 12, **characterized in that** said movable support is controlled by an actuator.

14. Device as claimed in one or more of claims 7 to 13, **characterized in that** a first end of said surface is fastened to a fixed structure supporting said conveyors and a second end is connected to said movable support.

15. Device as claimed in claim 14, **characterized in that** a connection is provided between the second end of said surface and said movable support to allow a relative movement between said movable support and said end.

16. Device as claimed in one or more of claims 7 to 15, **characterized in that** said movable support is integral with another supporting surface with variable inclination, forming a continuation of the supporting surface with variable conformation.

17. Device as claimed in claim 16, **characterized in that** said further supporting surfaced is a flat surface.

18. Device as claimed in one or more of the previous claims,
characterized in that said inclination is controlled so as to take a plurality of discrete values as a function of the operating conditions of the device.

19. Device as claimed in one or more of the previous claims,
characterized in that said inclination is controlled to be modified continuously as a function of said operating conditions, maintaining the angle of incidence of the sheets with respect to the stacking table essentially constant.

20. Method for forming piles of sheets fed continuously, wherein:

- a flow of partially overlapped sheets with a variable degree of shingling is formed on a series of conveyors;
- said sheets are accumulated on a stacking table to form piles of a predetermined number of sheets;
- by varying the degree of shingling of said sheets, a gap is produced in the flow to allow the removal of one pile and start forming a subsequent pile;

characterized in that the unloading angle of the last of said conveyors is modified as a function of the conditions in which said sheets are conveyed, to reduce the variation in the angle of incidence of the sheets with respect to the stacking table when the operating conditions vary.

21. Method as claimed in claim 20, **characterized in that** said unloading angle is varied as a function of the degree of reciprocal overlapping, or shingling, of the sheets.

22. Method as claimed in claim 20 or 21, **characterized in that** the degree of shingling of the sheets along said flow is determined and said angle is modified as a function of the degree of shingling of the sheets at the end portion of the last of said conveyors.

Amended claims in accordance with Rule 86(2) EPC.

1. A device for stacking sheets of cardboard or the like, including:

- an inlet section, in which the sheets are fed and disposed in a shingled arrangement, with a variable reciprocal degree of overlapping;
- a stacking station, in which predetermined quantities of sheets are stacked on a collection table to form piles of sheets;

a series of conveyors to convey the sheets from said inlet section to said
stacking station; wherein at least the unloading end of the last conveyor of said series has an inclination adjustable as a function of the operating conditions of the device, to reduce the variation of the angle of incidence of the sheets with respect to the stacking table when said operating conditions vary;
characterized in that said last conveyor includes a continuous flexible member, sliding on a supporting surface, said supporting surface having a variable conformation to modify the configuration of said flexible member.

2. Device as claimed in claim 1, **characterized in that** it includes a control unit, programmed to regulate said inclination as a function of the degree of shingling of the sheets being fed along said series of conveyors.

3. Device as claimed in claim 1 or 2, **characterized in that** said supporting surface is formed by an elastically deformable plate.

4. Device as claimed in claim 1, 2 or 3, **characterized in that** said supporting surface includes at least a guide channel for said flexible member.

5. Device as claimed in claim 4, **characterized in that** said supporting surface is formed by a folded plate to define said guide channel, which has a plurality of slots aligned along the direction of advance of said sheets, to maintain the flexibility of said plate.

6. Device as claimed in one or more of to the preceding claims, **characterized in that** disposed under said supporting surface with variable conformation is a movable support, which acts on said surface from the opposite side to the side on which said flexible member slides.

7. Device as claimed in claim 6, **characterized in that** said movable support includes a series of elongated elements, oriented according to the direction of advance of said flexible member.

8. Device as claimed in claim 7, **characterized in that** said elongated elements are integral with one another.

9. Device as claimed in one or more of claims 6 to 8, **characterized in that** said movable support has a curved supporting surface, against which the sliding surface of the flexible member of the conveyor is deformed.

10. Device as claimed in one or more of claims 6 to 9, **characterized in that** said movable support oscillates about an axis transverse with respect to the direction of advance of said flexible member.

11. Device as claimed in claim 10, **characterized in that** said support oscillates about an axis of rotation of a delivery roller of the sheets, disposed downstream of the last conveyor with respect to the direction of advance of the sheets.

12. Device as claimed in one or more of claims 6 to 11, **characterized in that** said movable support is controlled by an actuator.

13. Device as claimed in one or more of claims 6 to 12, **characterized in that** a first end of said surface is fastened to a fixed structure supporting said conveyors and a second end is connected to said movable support.

14. Device as claimed in claim 13, **characterized in that** a connection is provided between the second end of said surface and said movable support to allow a relative movement between said movable support and said end.

15. Device as claimed in one or more of claims 6 to 14, **characterized in that** said movable support is integral with another supporting surface with variable inclination, forming a continuation of the supporting surface with variable conformation.

16. Device as claimed in claim 15, **characterized in that** said further supporting surfaced is a flat surface.

17. Device as claimed in one or more of the previous claims, **characterized in that** said inclination is controlled so as to take a plurality of discrete values as a function of the operating conditions of the device.

18. Device as claimed in one or more of the previous claims, **characterized in that** said inclination is controlled to be modified continuously as a function of said operating conditions, maintaining the angle of incidence of the sheets with respect to the stacking table essentially constant.

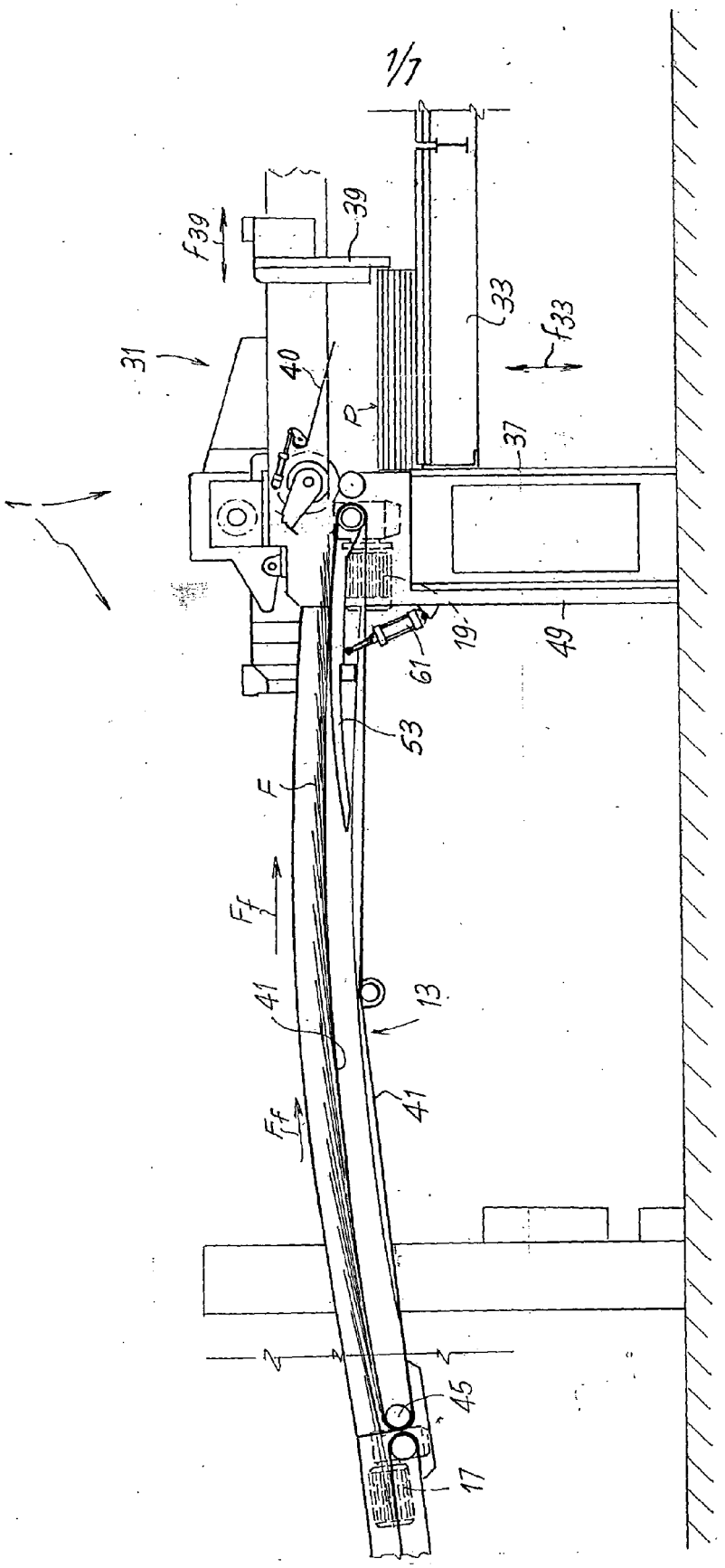


Fig.1A

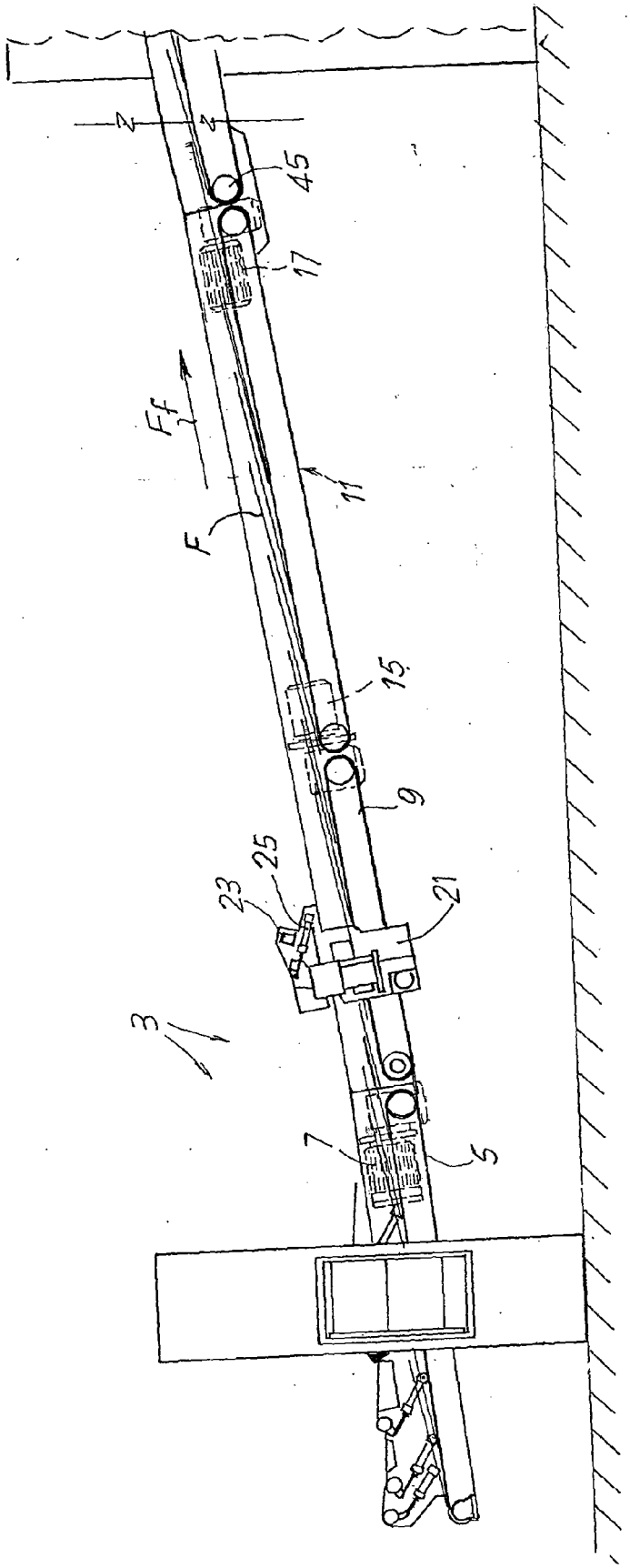
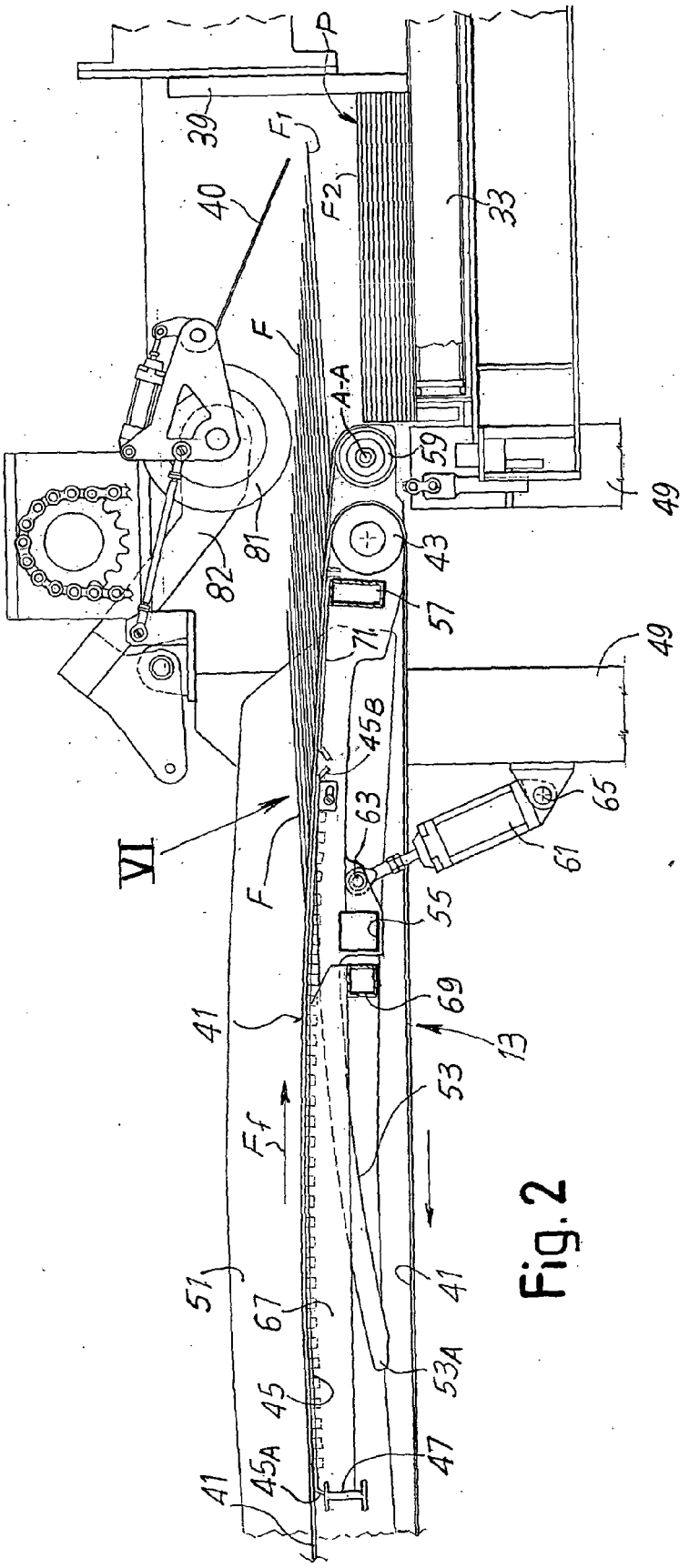


Fig.1B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F1
F2
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33
F
A-A
59
49
81
82
43
57
71
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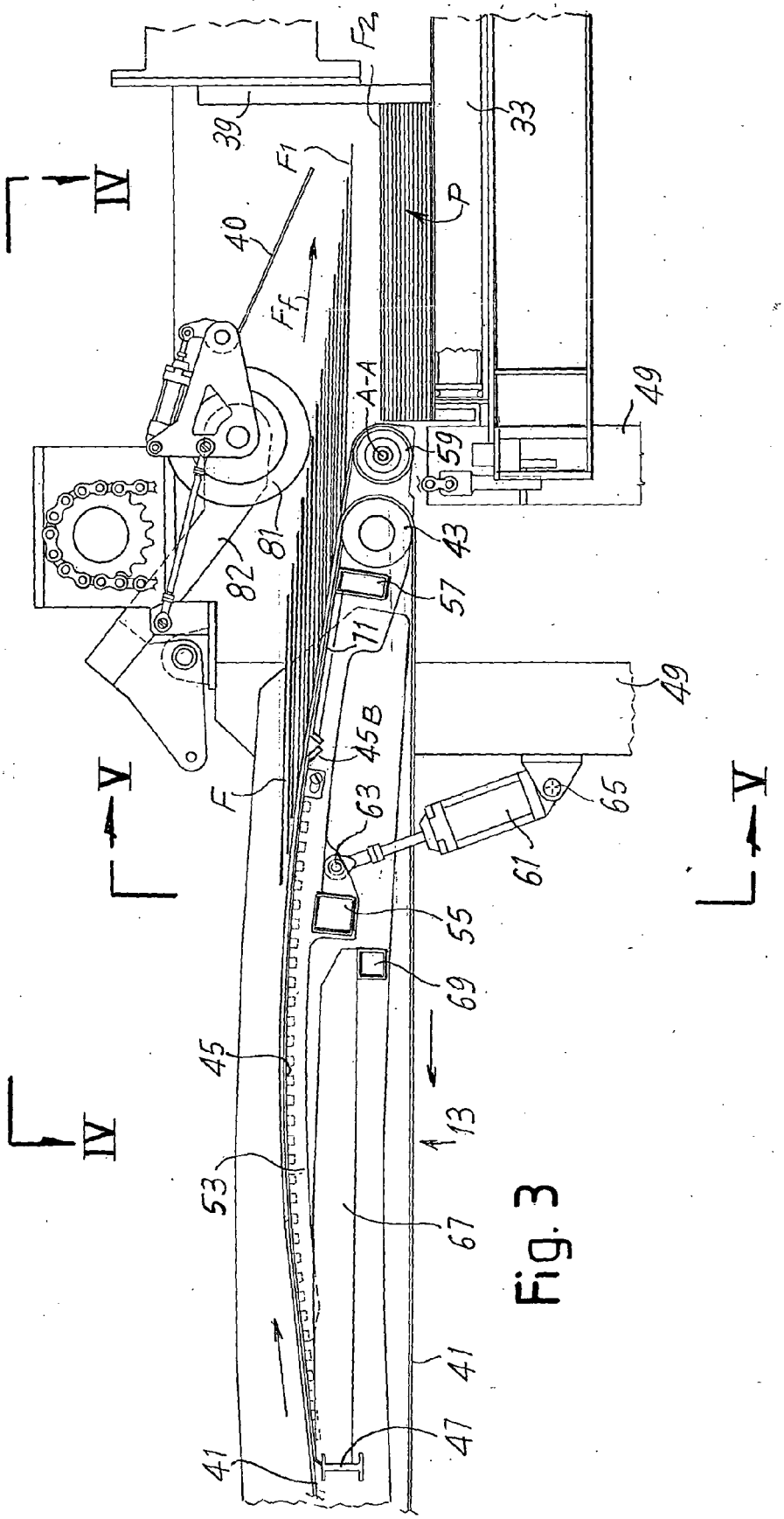
45B
63
65
VI
61
F
55
41
69
13
53
Ff
51
67
41
53A
45
47
45A
41

Fig. 2


IV
IV
V
V
A-A
F1
F2
Ff
P
39
33
40
49
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82
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11
45B
63
65
61
55
69
45
13
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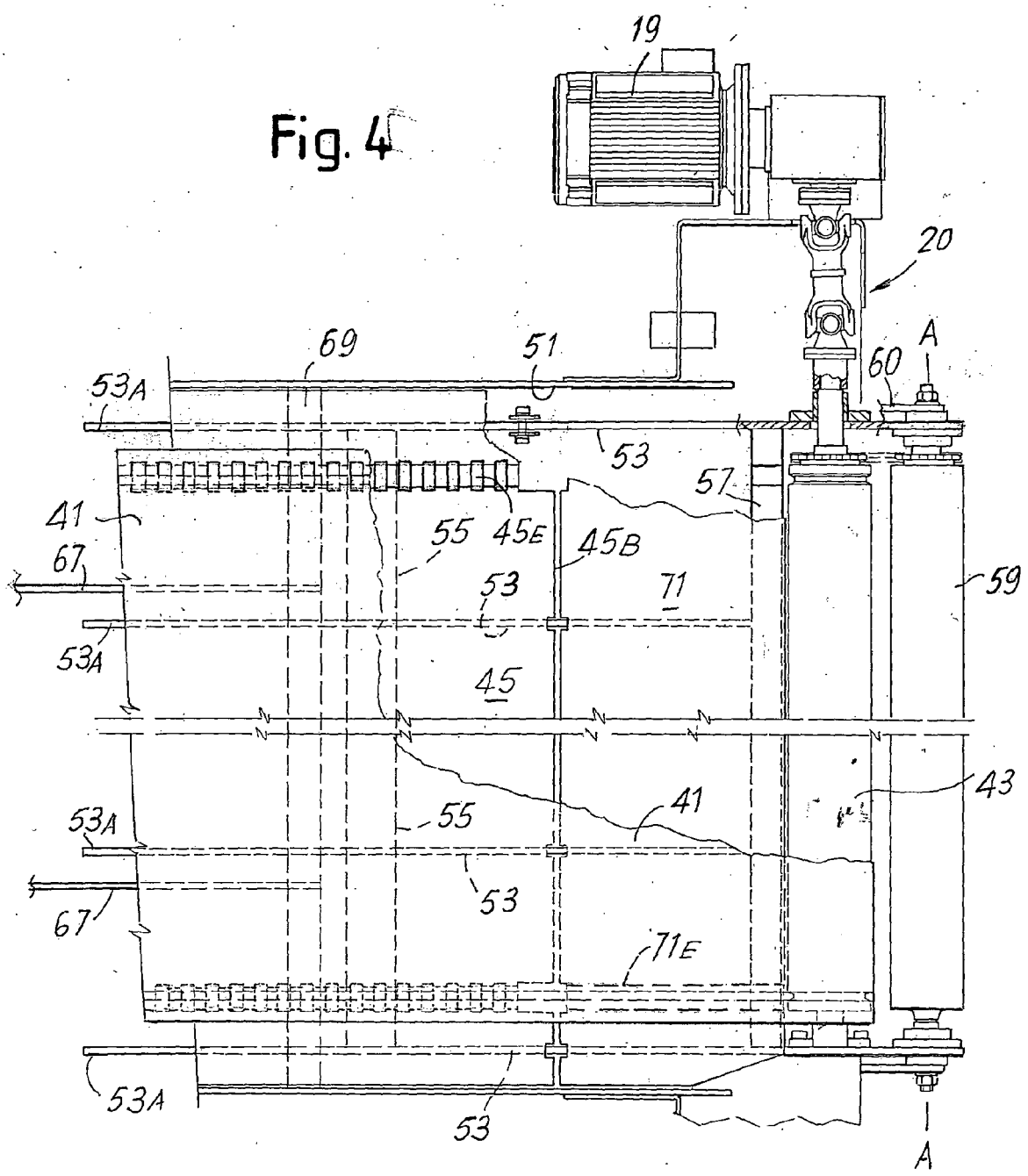
67
41
47

Fig. 3

Fig. 4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53A
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A
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45B
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53
A

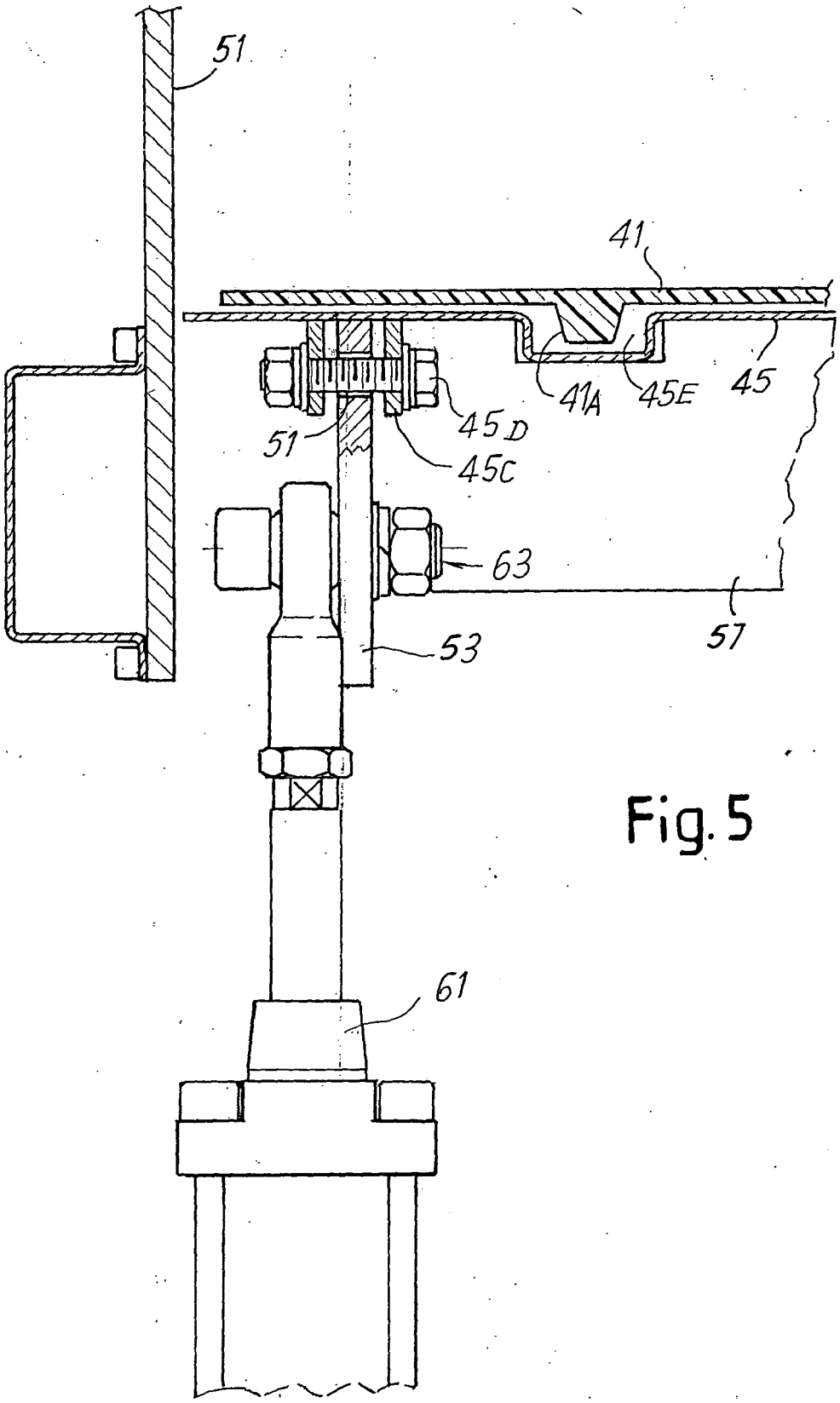

Fig. 5

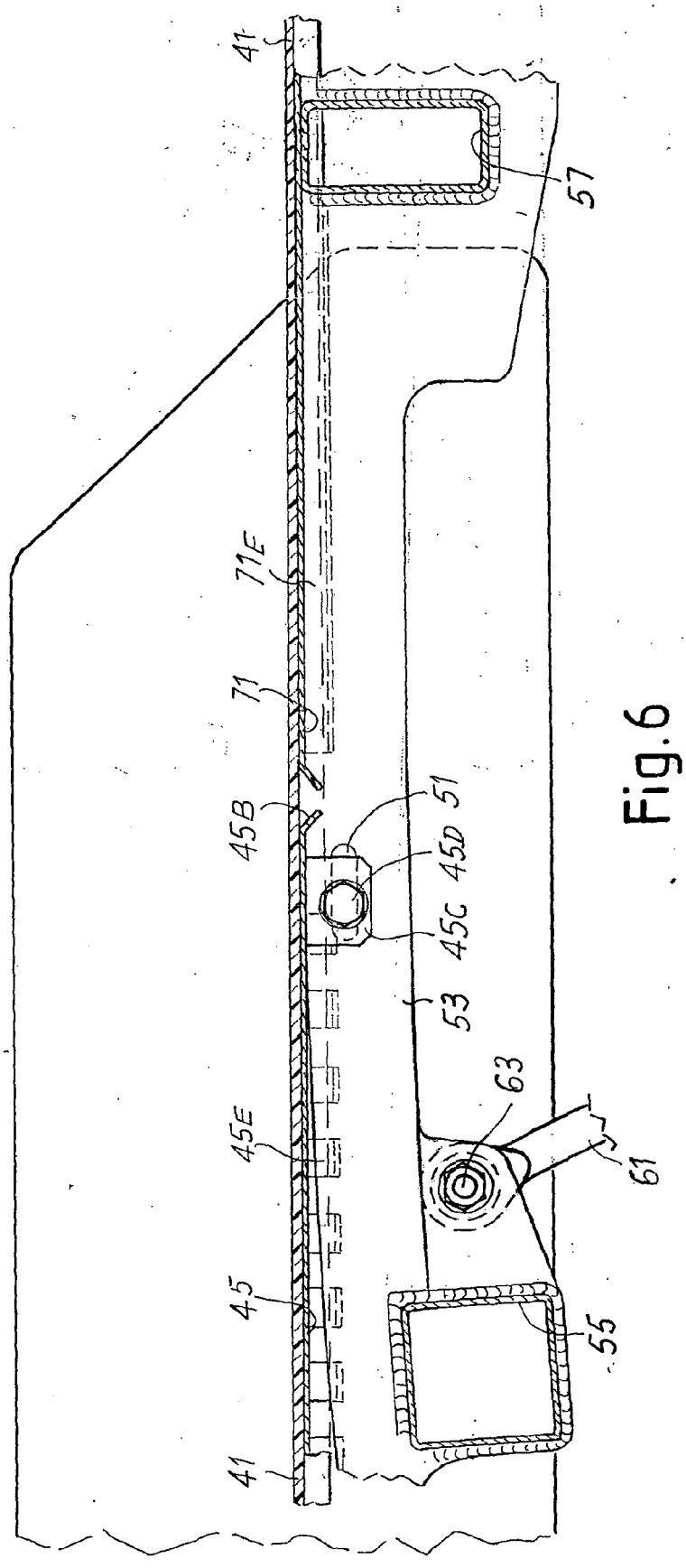

Fig.6

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 September 2005	Thibaut, E

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