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(54) **A device and method for producing a folded booklet**

(57) Device for producing a sealed booklet (1) comprising at least one folded signature (4) consisting of one or more layers, wherein the signature (4) comprises a strip (8) of single layer extending from a first outer layer of said signature (4), said strip extending parallel to the fold line (9) of said booklet, said device (1) comprising means (5) for folding said signature on said fold line (9), means for folding the strip onto the second outer layer of said signature, and adhesive application means (15) for applying an adhesive to a surface area on one of said strip and said second outer layer of said signature, said surface area being intended to contact a surface area of the other one of said strip and said second outer layer of said signature, wherein said adhesive application means are arranged to apply said adhesive (43) after said folding on said fold line of the signature has started.

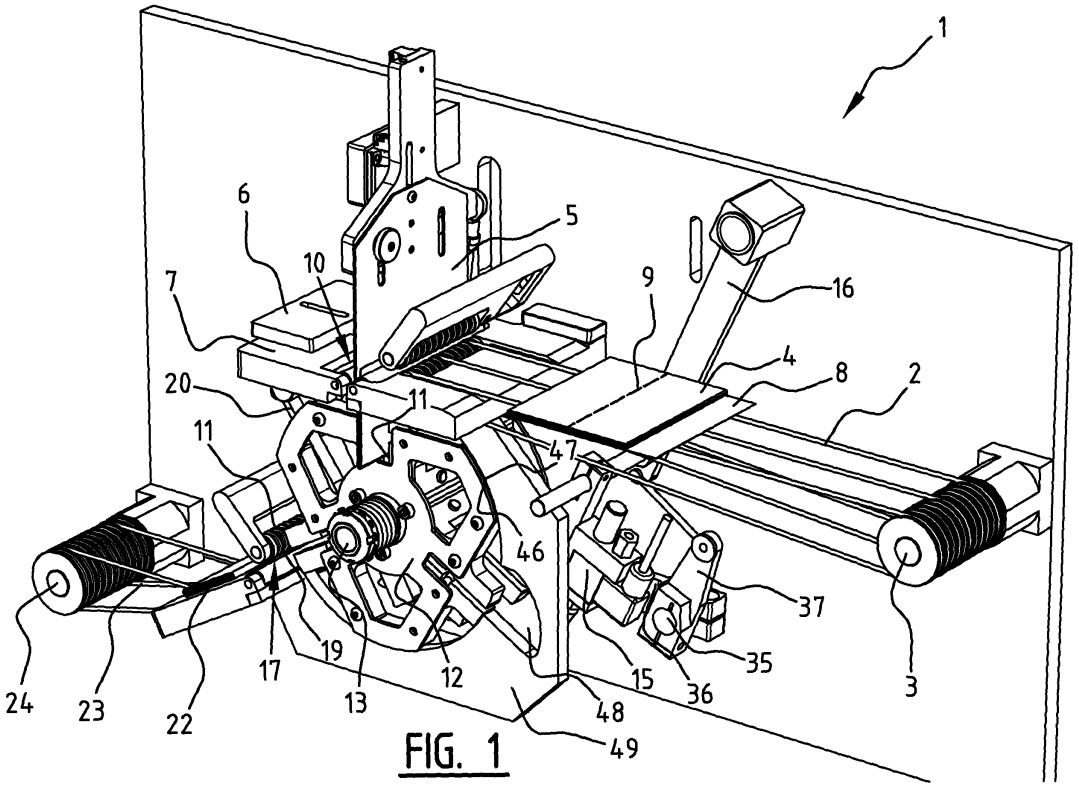

FIG. 1

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Description

[0001] The invention relates to a device for producing a sealed booklet comprising at least one folded signature consisting of one or more layers, wherein the signature comprises a strip of single layer extending from a first outer layer of said signature, said strip extending parallel to the fold line of said booklet. The signature is folded on said fold line, and then the strip is folded onto the second outer layer of said signature and adhered thereto by means of an adhesive to form said seal.

[0002] Such devices are known. In the known high speed folding devices signatures wherein adhesive is present on the strips are fed to the device, the signatures are folded and the strip is folded and sealed.

[0003] A disadvantage of the known devices is that parts of the folding device are contaminated by the adhesive present on the strip. It is one object of the invention to provide a device wherein this problem is at least partially solved. Another object of the invention is to provide a compact, efficient, reliable and/or fast device.

[0004] The device of the invention comprises means for folding said signature on said fold line, means for folding the strip onto the second outer layer of said signature, and adhesive application means for applying an adhesive to a surface area on one of said strip and said second outer layer of said signature, said surface area being intended to contact a surface area of the other one of said strip and said second outer layer of said signature. According to one aspect of the invention said adhesive application means are arranged to apply said adhesive after said folding on said fold line of the signature has started. Thereby at least the signature feeding part of the device will be free from contamination.

[0005] Said adhesive application means are in one embodiment arranged to apply said adhesive on said surface area on said second outer layer of said signature.

[0006] Said adhesive application means are in another embodiment arranged to apply said adhesive on said strip.

[0007] Said adhesive application means are in one embodiment arranged to apply said adhesive while the folded signature is being moved past said adhesive application means.

[0008] Said signature is preferably folded by pushing said fold line of said signature through a slot.

[0009] Said adhesive application means are preferably arranged to apply said adhesive at the downflow side of said slot.

[0010] Said adhesive application means are preferably arranged to apply said adhesive while the folded signature is being moved through said slot.

[0011] According to another aspect of the invention said device comprises a rotary transport means for transporting said folded signature, comprising at least one receiving slot extending in radial direction of said transport means.

[0012] Said rotary transport means is preferably arranged to be driven intermittently.

[0013] Said rotary transport means is preferably arranged to rotate 120 or 180 degrees between two standstills, or divisions by 2 thereof, and comprises a number of receiving slots distributed along the circumference in accordance therewith.

[0014] The device is preferably arranged to position the receiving slot adjacent the folding slot and move the signature through the folding slot into the receiving slot during standstill.

[0015] Said adhesive application means are in another embodiment arranged to apply said adhesive while said adhesive application means are moving and the folded signature is at stand still after being rotated away from the folding slot.

[0016] The device is preferably arranged to fold the strip substantially by 90 degrees during rotation, by rotating the signature in the receiving slot with the strip extending outward past a folding edge extending axially adjacent the circumference of said transport means.

[0017] The device preferably comprises a sealing pinch arranged to push said surface areas of said strip and said second outer layer onto each other, said pinch extending axially adjacent the circumference of said transport means, and said device is further arranged to position the receiving slot adjacent the sealing pinch and to move the signature out of the receiving slot through the sealing pinch during standstill.

[0018] The invention further relates to a method for producing a sealed booklet comprising at least one folded signature consisting of one or more layers, wherein the signature comprises a strip of single layer extending from a first outer layer of said signature, said strip extending parallel to the fold line of said booklet, said method comprising the steps of folding said signature on said fold line, folding the strip onto the second outer layer of said signature, and applying an adhesive to a surface are on one of said strip and said second outer layer of said signature, bringing said surface area into contact with a surface area of the other one of said strip and said second outer layer of said signature, wherein said adhesive is applied after said folding on said fold line of the signature has started.

[0019] The invention will be explained in more detail with reference to the figures, wherein:

Figure 1 is a perspective front/right view of a device for producing a folded booklet;

Figure 2 is a perspective front/left view of the device of figure 1;

Figure 3 is a perspective rear view of the device of figure 1;

Figures 4A-E are a view of the device of figure 1 in various steps of the production of a folded booklet;

Figure 5 is a perspective view of a second embodiment of the device for folding a booklet; and

Figure 6 is a perspective view of a third embodiment of the device for folding a booklet.

[0020] Figures 1 and 2 show a device for producing a folded booklet 1, comprising a conveyer belt 2 driven by rotation of an shaft 3 on which a signature consisting of a multiple layered folded sheet 4 is transported in the direction of a plate shaped fold member 5 until it is stopped by stop block 6 and rests on stop surface 7. Folded sheet 4 is previously folded, by folding means not shown, in such a manner that an uncovered strip 8 of single sheet extends from one of the outer layers of the folded sheet 4. Fold member 5 folds the folded sheet 4 at a center line 9 of the folded sheet 4 that is parallel to the side of sheet 4 from which the strip 8 extends, by pushing the folded sheet 4 through a slot 10 of the stop surface 7 into a slot 11 of a rotation wheel 12. Rotation wheel 12 is driven by an outgoing shaft 13, such that rotation wheel 12 alternately makes a rotational movement of 120° and stands still. During the stand still period of rotation wheel 12 the fold member 5 is moved between a first upper position, wherein the lower part of the plate shaped fold member 5 is above the slot 10 of stop surface 7, and a second lower position, wherein the lower part of the plate shaped fold member 5 is located in the slot 10 of stop surface 7. This movement of the fold member 5 is controlled by an arm 14. By moving the fold member 5 from the first upper position to the second lower position, the folded sheet 4 is folded along center line 9. By moving the fold member 5 from the second lower position to the first upper position, the just folded folded sheet 4 is left in slot 11 of the rotation wheel 12. When the fold member 5 is back in its first upper position, the rotation wheel 12 will start another rotational movement of 120°.

[0021] Figures 1 and 2 further show that rotation wheel 12 comprises three slots 11 for containing the folded sheet 4 in three production steps of the folded booklet. These steps comprise the folding of the folded sheet 4 as described above, putting an adhesive on strip 8 of folded sheet 4 by means of a spray unit 15 that is pivotally connected by an arm 16, and pushing sheet 4 through a pinch 17 between a first roller 18 and a second roller 19 with use of a push member 20 connected by an arm 21, such that strip 8 is adhered to folded sheet 4. The thus folded booklet 22 is transported away from device 1 by means of a second conveyer belt 23 driven by rotation of a shaft 24. The three production steps will be described in more detail hereafter.

[0022] Figure 3 shows the rear of device 1, which shows an ingoing shaft 30 of an index mechanism 31 that is driven by drive means (not shown). Index mechanism 31 has an ingoing shaft 30 and an outgoing shaft 13, to which outgoing shaft 13 the drive wheel 12 is attached (see figs. 1, 2). Ingoing shaft 30 rotates with a substantially constant speed and for each revolution of 360° of the ingoing shaft 30, the outgoing shaft 12 rotates 120°, wherein the outgoing shaft 12 stands still during some part of the time and makes the rotational movement during some other part of the time. Ingoing shaft 30 comprises a cam disc 32 to which a cam 33 is placed in resilient abutment. Cam disc 32 is shaped in such a way that the cam 33 is pivoted in direction 34 for approximately 60°. Cam 33 is connected to pivot axis 35, so that pivot axis 35 also pivots in direction 34 for approximately 60°. This pivotal movement of pivot axis 35 controls the movement of the first arm 14 of the fold member 5, the second arm 16 of the spray unit 15, and the third arm 21 of push member 20, wherein the first and third arm 14, 21 are interconnected to pivot axis 35 with use of lever 36, and wherein arm 16 is directly connected to pivot axis 35 with use of member 37(see fig. 1, 2). In figure 3, also a handle 38 is shown, that can be used to adjust the width of slot 10 in stop surface 7 (see fig. 1, 2).

[0023] Figures 4A-E show the different production steps of the folded booklet. In figure 4A the first step comprising folding the folded sheet 4 is shown. Folded sheet 4 rests on stop surface 7 against stop block 6 and is held in place by a roller 40, such that folded sheet 4 can be accurately folded. Fold member 5 is moved between said upper first and said lower second position in direction 41, so that fold member 5 folds folded sheet 4 and places the just folded sheet 4 in slot 11 of rotation wheel 12. During the movement of fold member 5 between said upper first and said lower second position, the rotation wheel 12 stands still. In figure 4A clamping members 42 are shown that can be moved between a first position wherein the clamping members 42 are close to each other and a second position wherein the clamping members 42 are at a distance from each other. The distance between clamping members 42 in the first position is preferably equal or smaller than the thickness of the folded sheet 4, so that folded sheet 4 can be clamped between the clamping members 42 when the clamping members 42 are in the first position. The distance between clamping members 42 in the second position is preferably larger than the thickness of the folded sheet 4, so that folded sheet 4 can be easily placed between or removed from the clamping members 42 when the clamping members 42 are in the second position. The distance between the clamping members 42 in the first and second positions is preferably adjustable, so that this distance can be adjusted to the thickness of the folded sheet.

[0024] When the fold member 5 is back in the first upper position, clamping members 42 are moved from the first to the second position, so that folded sheet 4 is clamped between clamping members 42. Then the rotation wheel 12 is rotated 120° in clockwise direction, so that folded sheet 4 is in the position for the second production step shown in figure 4B. In the second production step, rotation wheel 12 stands still so that an adhesive 43 can be sprayed on said strip 8 of said folded sheet 4 by a nozzle 44 of said spray unit 15. Spray unit 15 is

pivotally connected by said arm 16 (see figure 1 and 2), so that spray unit 15 is pivoted back and forth in direction 45 during spraying of the adhesive 43. Because of the pivotal movement of spray unit 15 and the stand still position of rotation wheel 12, the adhesive 43 is sprayed over the width of strip 8, such that a line of adhesive 43 is formed. Instead of one nozzle 44, multiple nozzles can be used so that multiple lines of adhesive 43 are applied. Instead of a nozzle 44 that sprays the adhesive 43 on the strip 8, also a brush can be used.

[0025] With reference to figures 1, 2, 4A, B, it can be seen that strip 8 is folded for preferably less than 90° in the direction of folded sheet 4 between an edge 46 of said rotation wheel 12 and an edge 47 of a housing 49 in which said rotation wheel 12 is rotated. Preferably, the angle between the strip 8 and folded sheet 4 is 0° in the second production step, so that the adhesive 43 can be properly applied to strip 8. Therefore, said housing 49 comprises a space 48 (see figures 1, 2), so that in case strip 8 is slightly bent in the direction of folded sheet 4 between edge 46 and 47 of respectively rotation wheel 12 and housing 49, it can return to its unfolded state wherein strip 8 extends from folded sheet 4 with an angle of 0° by its inertia. An air jet nozzle may mounted in the device to blow strip 8 back to its unfolded state, if necessary. Preferably, device 1 is formed in such a way that strip 8 is not really folded but only slightly bent in the direction of folded sheet 4 during the rotational movement of 120° of rotation wheel 12 from the first to the second production step, for example by having a curved edge 47 of housing 49 such that a space is formed between edge 46 of rotation wheel 12 and edge 47 of housing 49.

[0026] After applying the adhesive 43, the rotation wheel 12 is again rotated for 120° in clockwise direction 50 for the third production step, as shown in figure 4C. During this rotational movement of rotation wheel 12, strip 8 will be folded in the direction of folded sheet 4 by stop member 51, such that the angle between strip 8 and folded sheet 4 is approximately 90°, as can be seen in figure 4D. After folding, the rotation wheel 12 stands still, as is the situation in figure 4D. In figure 4D, E said push member 20 is shown, which can be pivoted in direction 52. During the stand still period of rotation wheel 12, push member 20 will be pivoted in direction 52, so that folded sheet 4 is pushed through pinch 17 between rollers 18 and 19. During the pushing of folded sheet 4 through pinch 17, strip 8 is folded further in the direction of sheet 4 such that strip 8 extends parallel over the outer layer of sheet 4, wherein the adhesive extends between strip 8 and folded sheet 4. Rollers 18, 19 will press strip 8 and sheet 4 together so that strip 8 is adhered to sheet 4, as can be seen in figure 4E. After this last step, folded sheet 4 and strip 8 together form said booklet 22, which is transported away with use of said second conveyer belt 23 driven by rotation of an shaft 24.

[0027] In figure 5, a further embodiment of device 1 for producing a folded booklet is shown. An adhesive 43 can be sprayed on the outer layer of sheet 4 by a nozzle 44 of said spray unit 15. Spray unit 15 is mounted next to the slot 10 under the stop surface 7. The adhesive 43 is sprayed over the width of strip 8 in the radially outer surface area of said outer layer while the folded sheet is moved through the slot 10, such that a line of adhesive 43 is formed. Instead of one nozzle 44, multiple nozzles can be used so that multiple lines of adhesive 43 are applied. In this embodiment the adhesive spray unit 15 as shown in figures 1 - 5 may or may not be omitted. In the case that the spray unit 15 as shown in figures 1 - 5 is omitted, the rotation wheel 12 may be provided with only two slots 11 extending at a mutual angle of 180°, and the wheel will then also be driven intermittently with rotational movements of 180°.

[0028] In figure 6, a further embodiment of device 1 for producing a folded booklet is shown, wherein device 1 is mounted on a frame 60. Conveyer belts 2 and 23 comprise double belts 2A, B and 23A, B so that folded sheet 4 and the booklet (not shown) are transported between the double belts 2A, B and 23A, B, so that folded sheet 4 and the booklet stay in a firmly fixed position on conveyer belts 2, 23.

[0029] It will be appreciated that the different features of the shown embodiments can be combined into other embodiments. The signature may for instance also be comprised of multiple sheets stitched together on the center fold line 9 and one outer sheet being provided with the strip portion 8, or it may be a single unfolded sheet with a strip portion 8 and a center fold line 9. The invention is not restricted to the embodiments shown in the drawing, but it also extends to other preferred embodiments that fall within the scope of the appended claims.

Claims

1. A device for producing a sealed booklet comprising at least one folded signature consisting of one or more layers, wherein the signature comprises a strip of single layer extending from a first outer layer of said signature, said strip extending parallel to the fold line of said booklet, said device comprising means for folding said signature on said fold line, means for folding the strip onto the second outer layer of said signature, and adhesive application means for applying an adhesive to a surface are on one of said strip and said second outer layer of said signature, said surface area being intended to contact a surface area of the other one of said strip and said second outer layer of said signature, wherein said adhesive application means are arranged to apply said adhesive after said folding on said fold line of the signature has started.

2. The device according to claim 1, wherein said adhesive application means are arranged to apply said adhesive on said surface area on said second outer layer of said signature.

3. The device according to claim 1 or 2, wherein said adhesive application means are arranged to apply said adhesive on said strip.

4. The device according to claim 1, 2 or 3, wherein said adhesive application means are arranged to apply said adhesive while the folded signature is being moved past said adhesive application means.

5. The device according to any of the previous claims 1 - 4, wherein said signature is folded by pushing said fold line of said signature through a slot.

6. The device according to claim 5, wherein said adhesive application means are arranged to apply said adhesive at the downflow side of said slot.

7. The device according to claim 5 or 6, wherein said adhesive application means are arranged to apply said adhesive while the folded signature is being moved through said slot.

8. The device according to any of the previous claims 1 - 7, wherein said device comprises a rotary transport means for transporting said folded signature, comprising at least one receiving slot extending in radial direction of said transport means.

9. The device according to claim 8, wherein said rotary transport means is arranged to be driven intermittently.

10. The device according to claim 8 or 9, wherein said rotary transport means is arranged to rotate 120 or 180 degrees between two standstills, or divisions by 2 thereof, and comprises a number of receiving slots distributed along the circumference in accordance therewith.

11. The device according to claim 8, 9 or 10, wherein the device is arranged to position the receiving slot adjacent the folding slot and move the signature through the folding slot into the receiving slot during standstill.

12. The device according to any of the previous claims 8 - 11, wherein said adhesive application means are arranged to apply said adhesive while said adhesive application means are moving and the folded signature is at stand still after being rotated away from the folding slot.

13. The device according to any of the previous claims 8 - 12, wherein the device is arranged to fold the strip substantially by 90 degrees during rotation, by rotating the signature in the receiving slot with the strip extending outward past a folding edge extending axially adjacent the circumference of said transport means.

14. The device according to any of the previous claims 8 - 13, wherein the device comprises a sealing pinch arranged to push said surface areas of said strip and said second outer layer onto each other, said pinch extending axially adjacent the circumference of said transport means, and said device is further arranged to position the receiving slot adjacent the sealing pinch and to move the signature out of the receiving slot through the sealing pinch during standstill.

15. A method for producing a sealed booklet comprising at least one folded signature consisting of one or more layers, wherein the signature comprises a strip of single layer extending from a first outer layer of said signature, said strip extending parallel to the fold line of said booklet, said method comprising the steps of folding said signature on said fold line, folding the strip onto the second outer layer of said signature, and applying an adhesive to a surface area on one of said strip and said second outer layer of said signature, bringing said surface area into contact with a surface area of the other one of said strip and said second outer layer of said signature, wherein said adhesive is applied after said folding on said fold line of the signature has started.

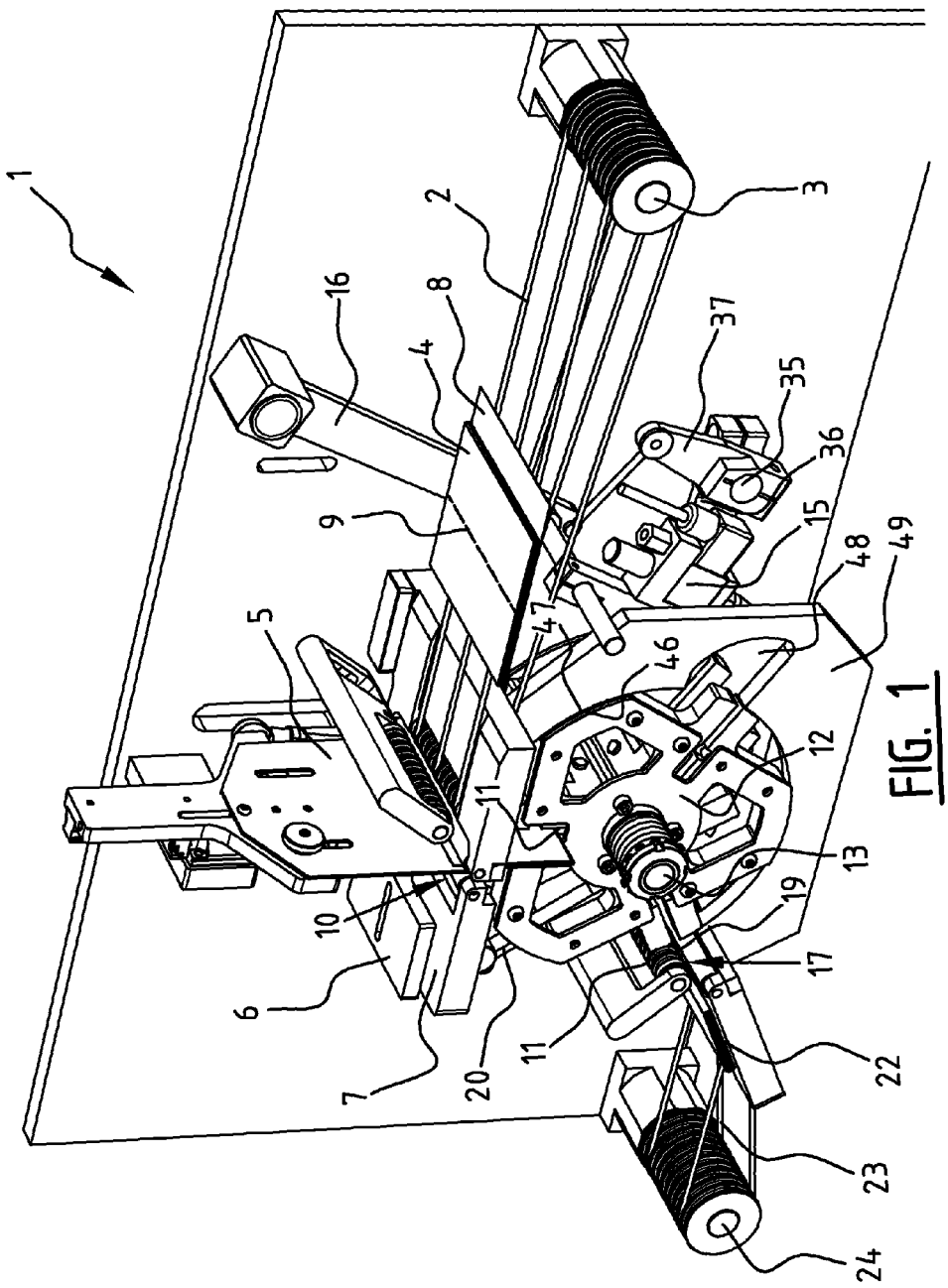


FIG. 1

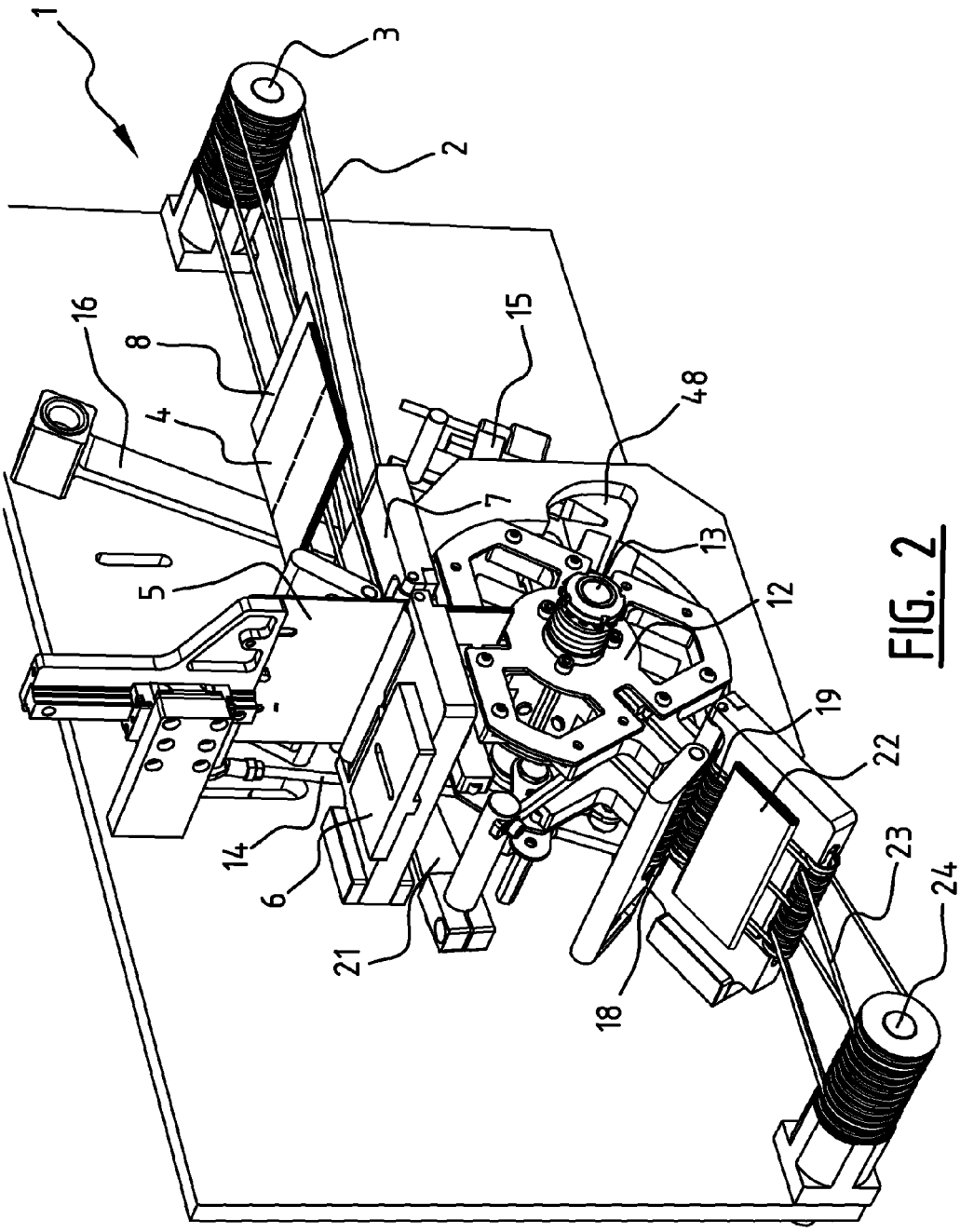


FIG. 2

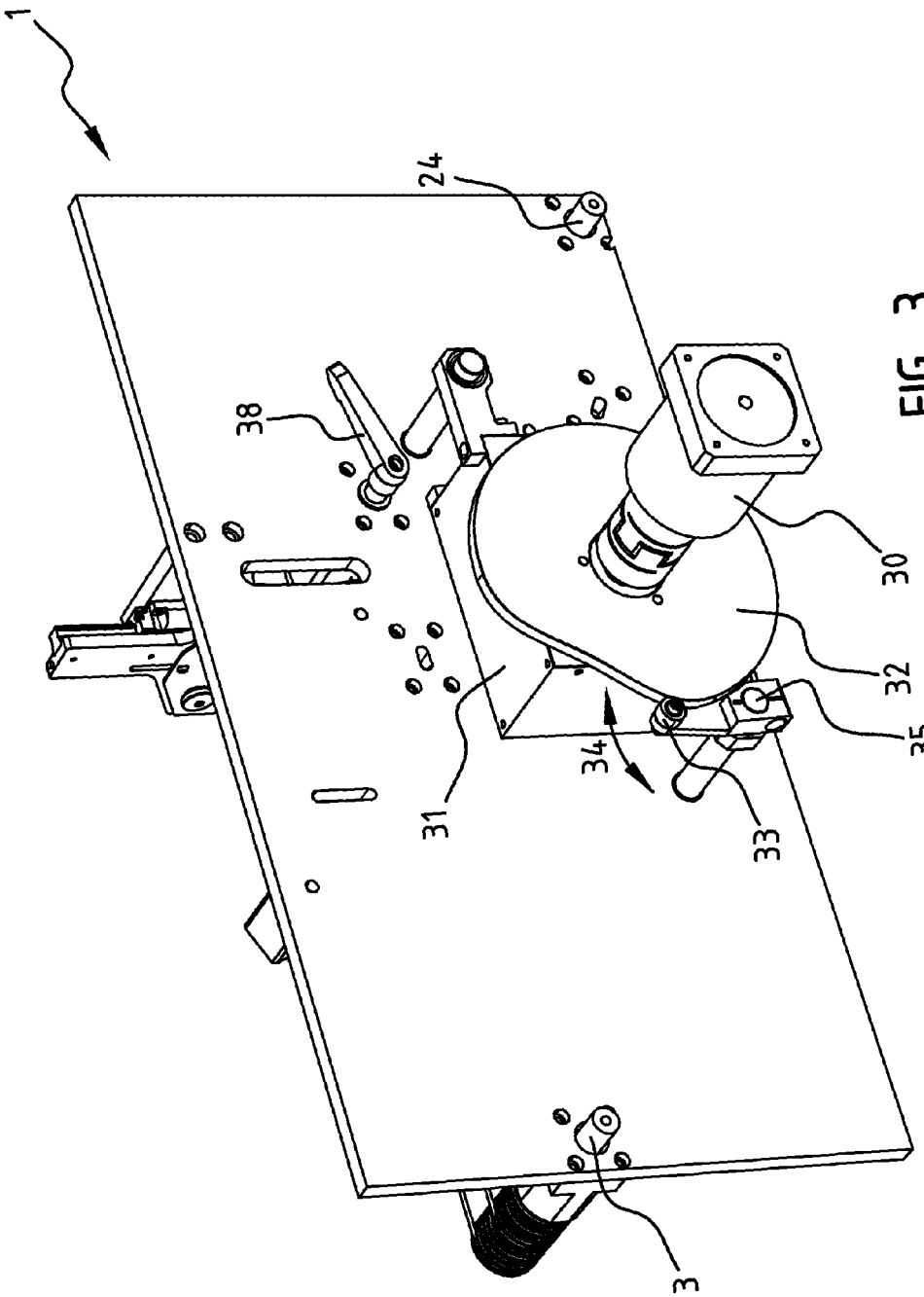


FIG. 3

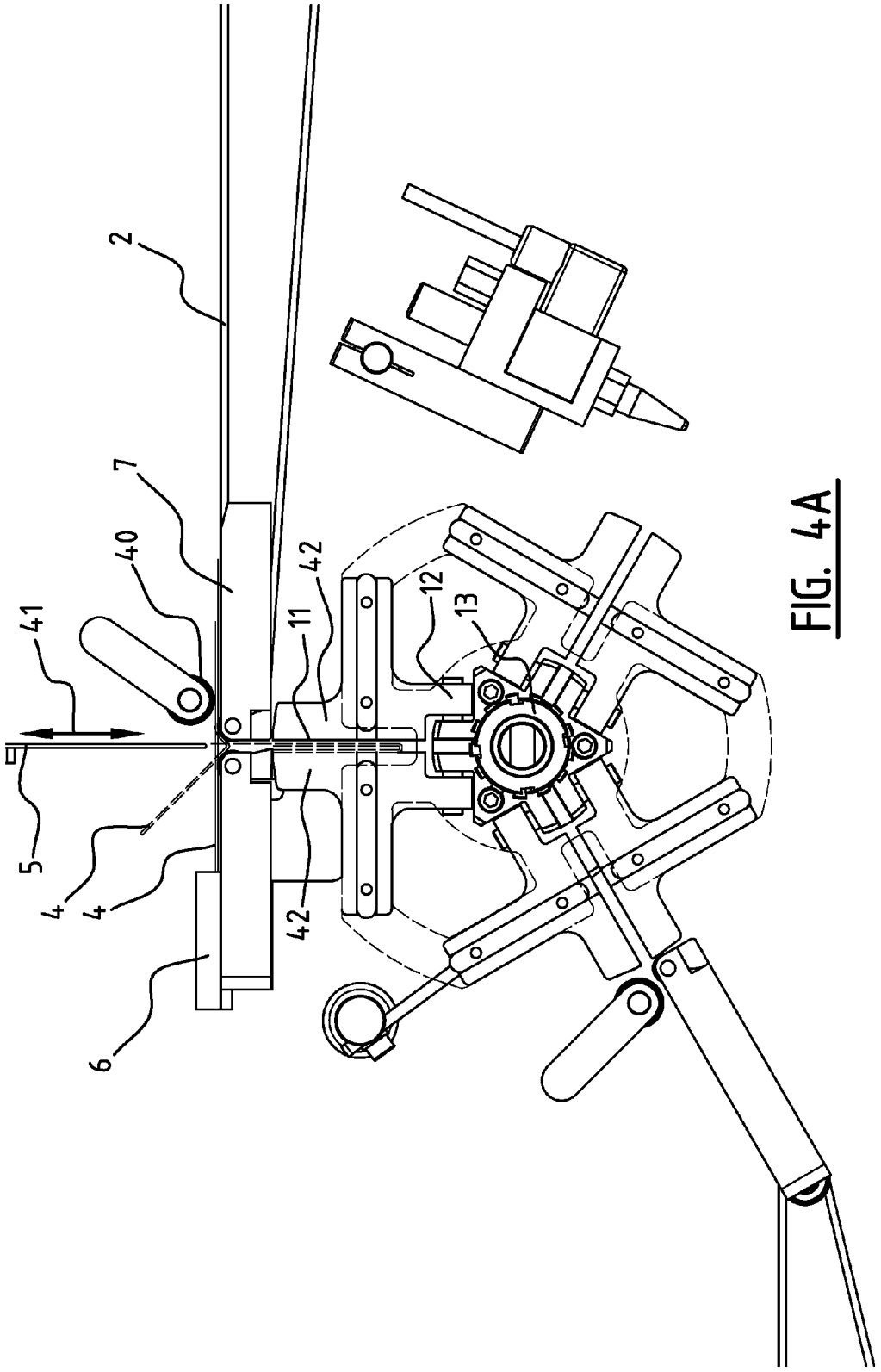


FIG. 4A

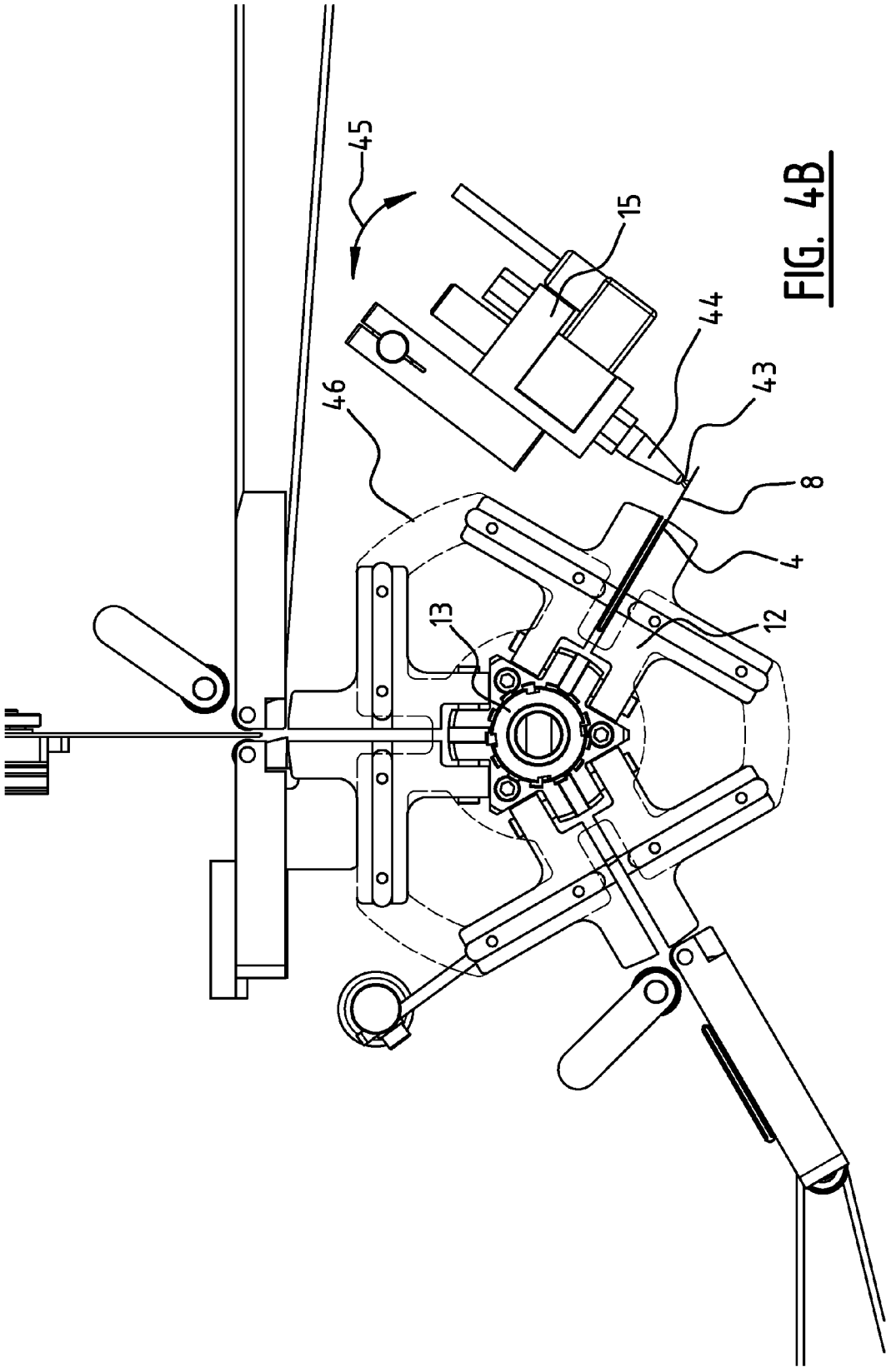


FIG. 4B

FIG. 4C

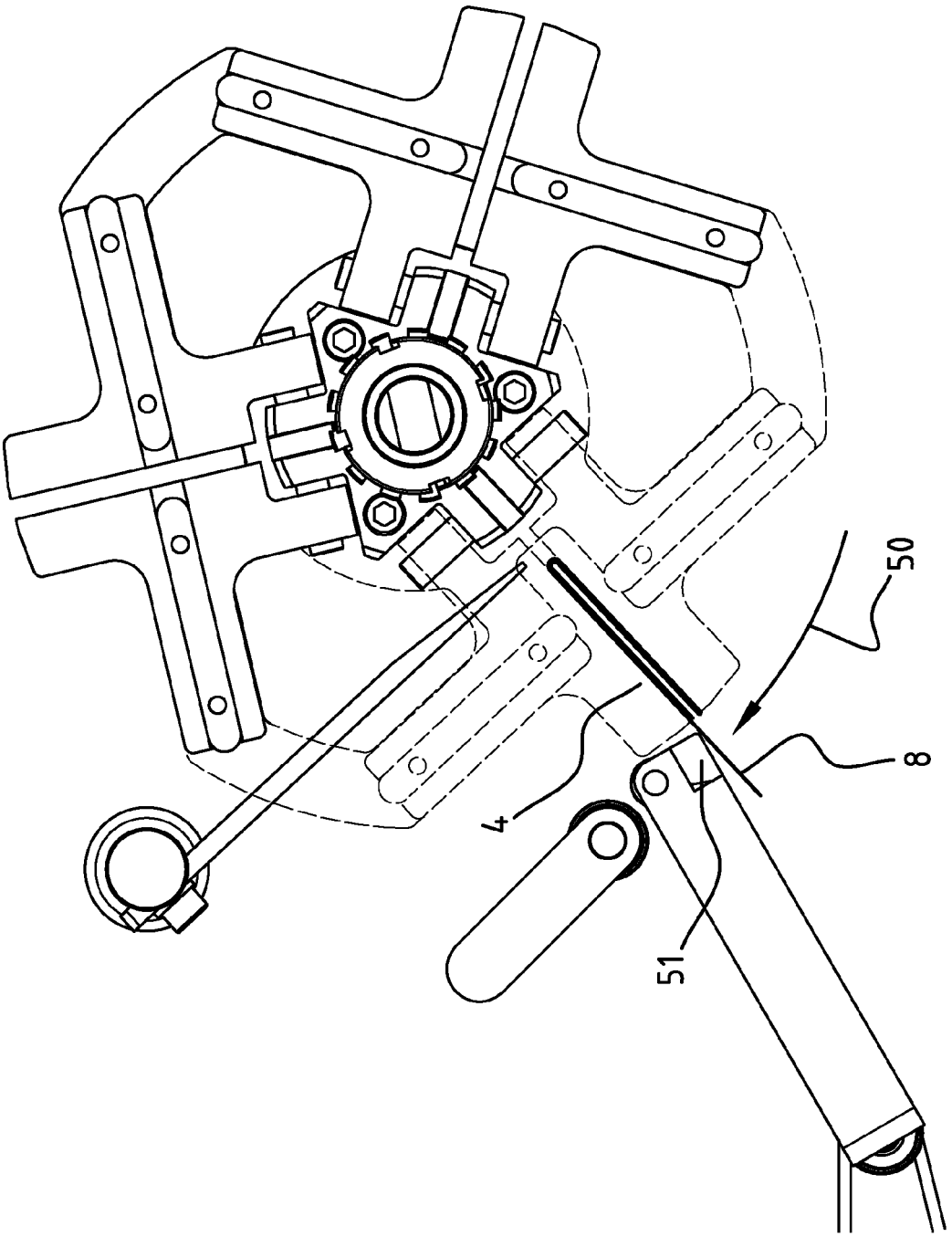
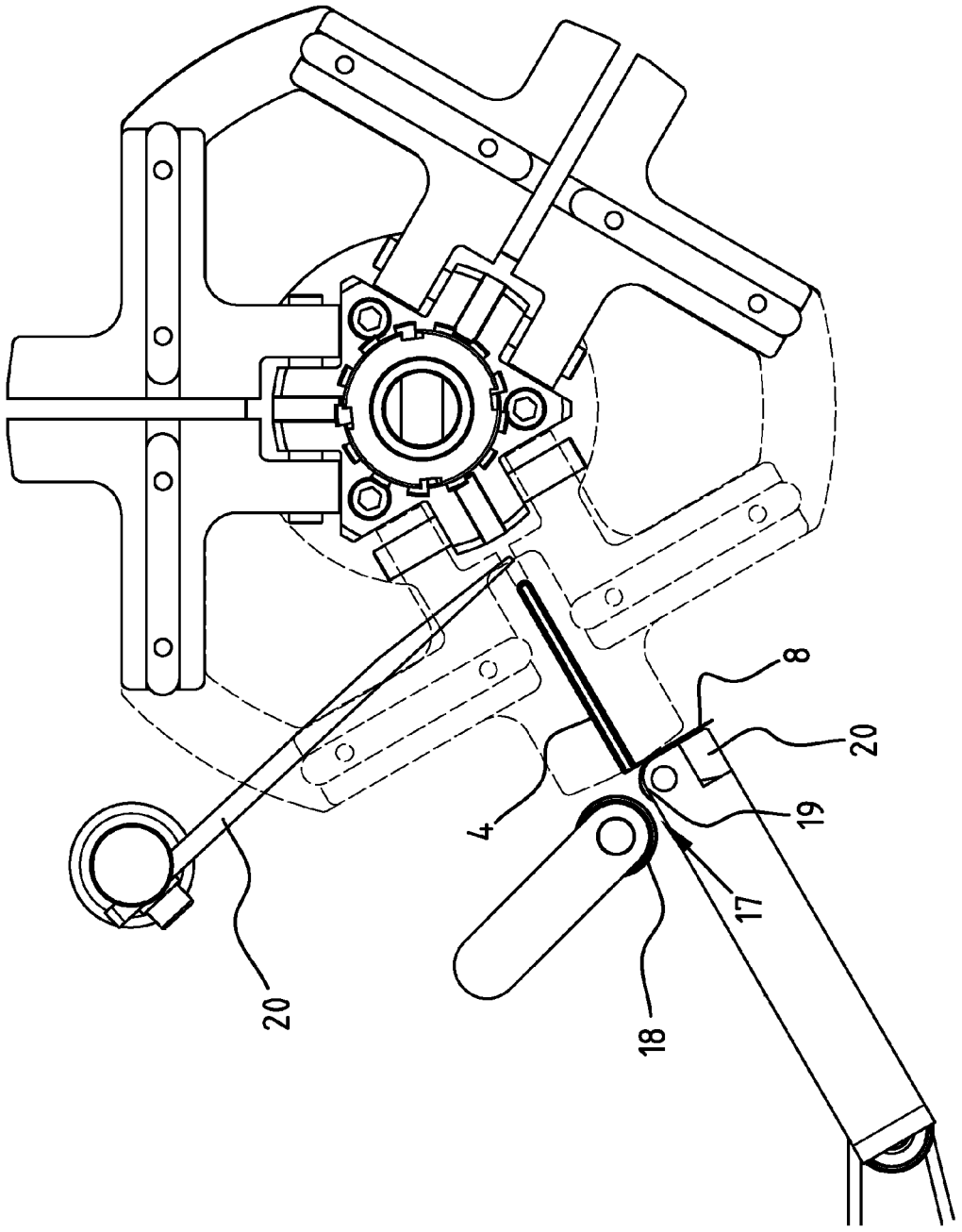


FIG. 4D



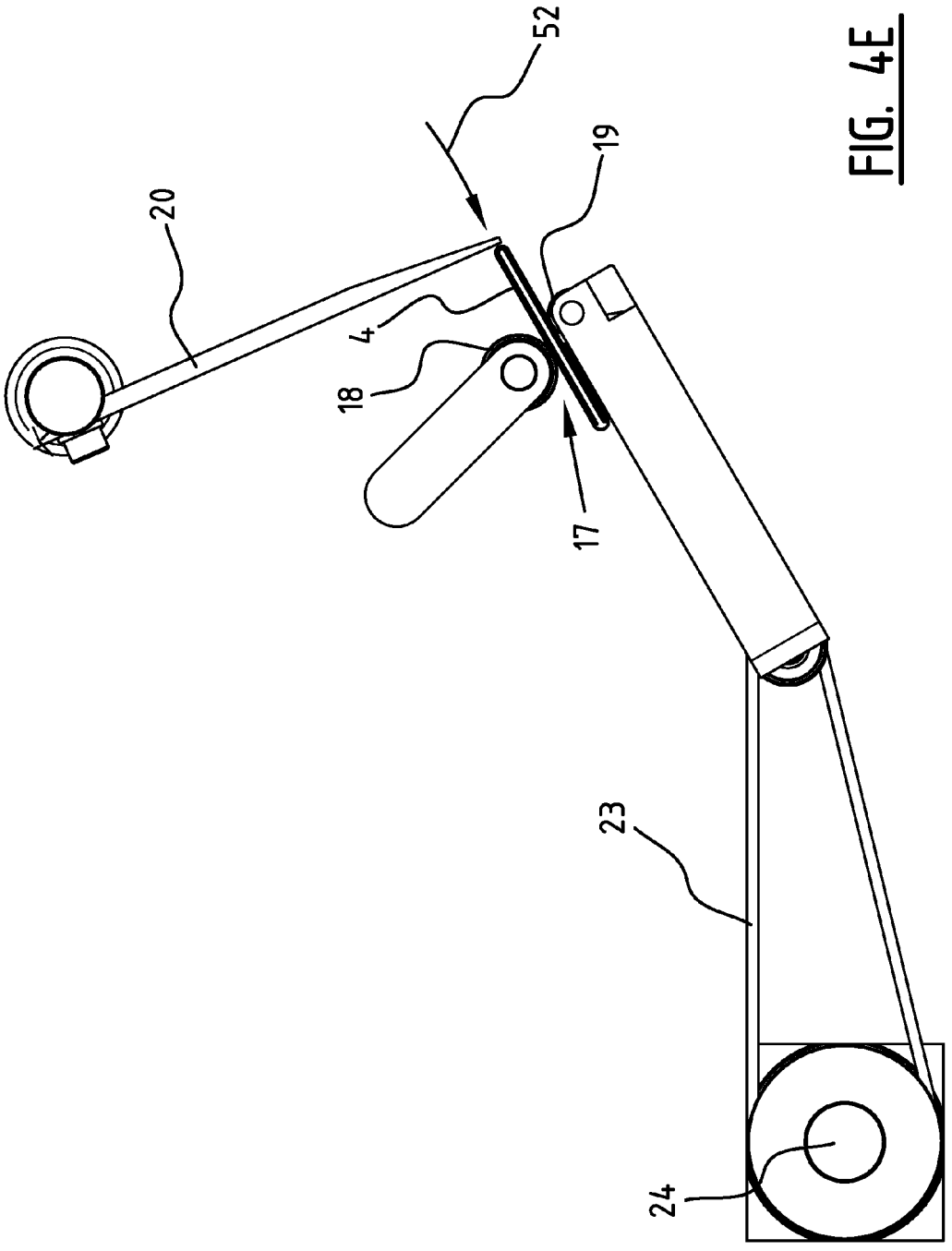


FIG. 4E

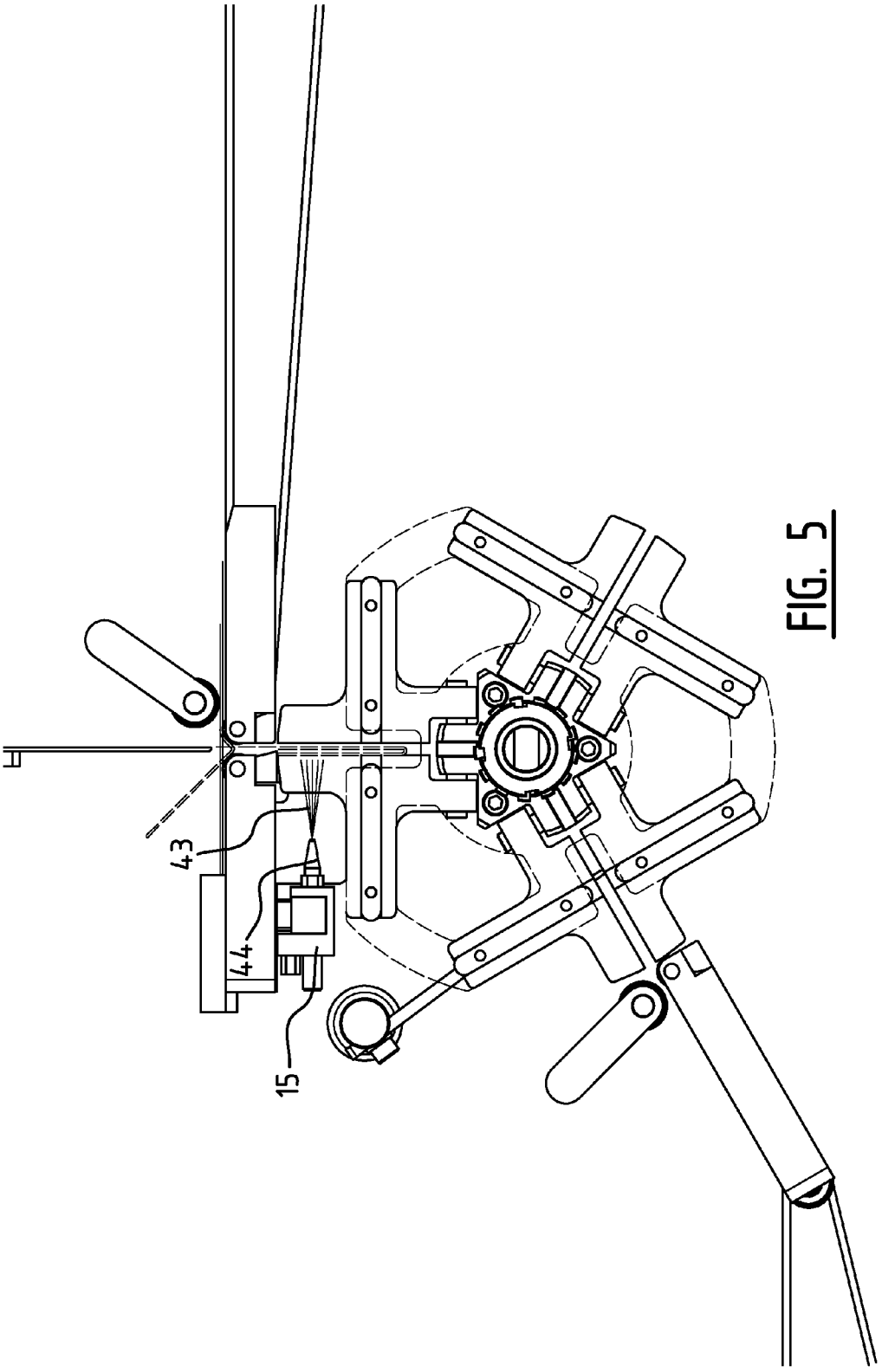


FIG. 5

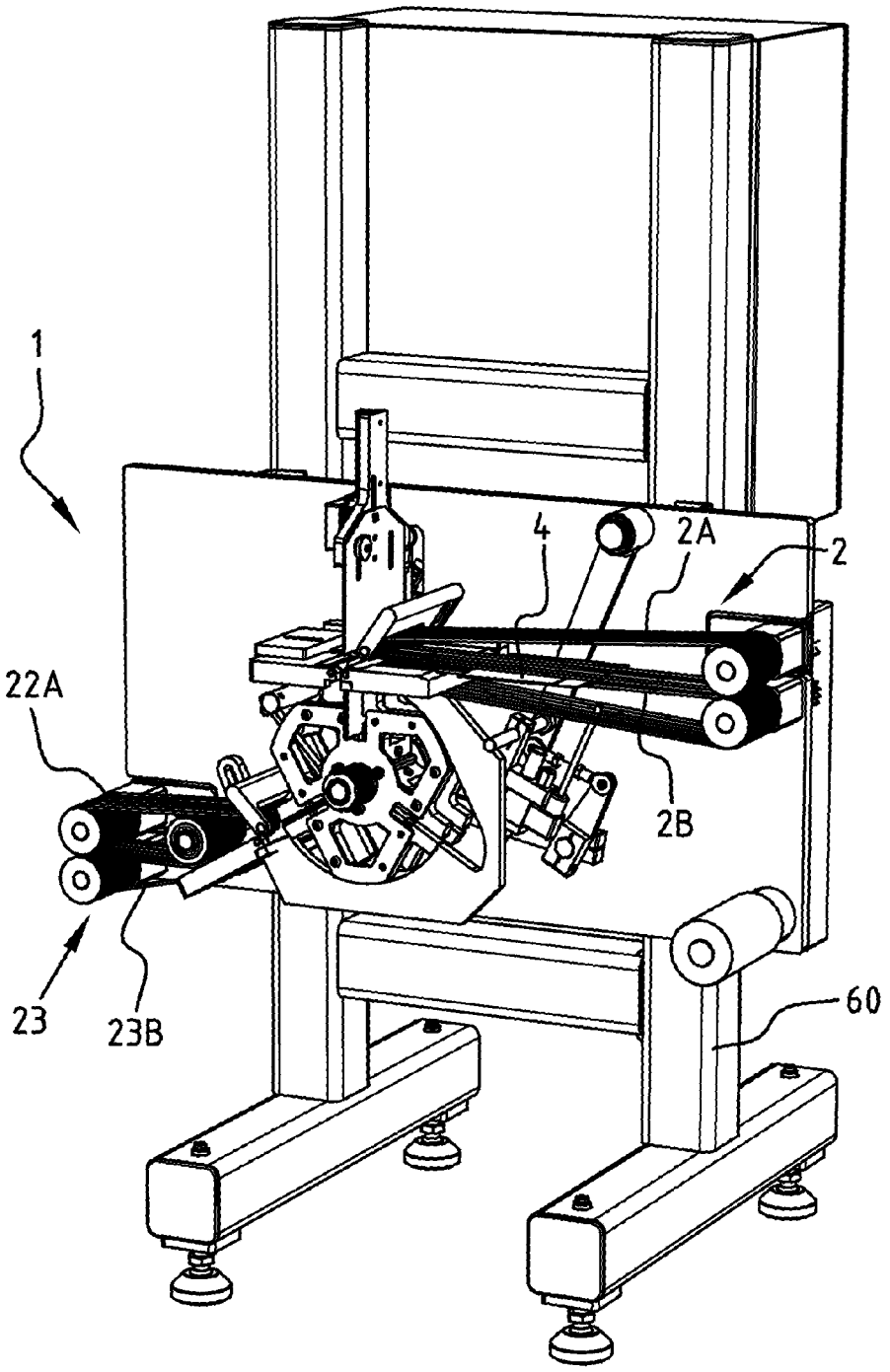


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 09 16 7386

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 40 38 961 A1 (WOMAKO MASCH KONSTR [DE]) 11 June 1992 (1992-06-11) * the whole document *	1,15	INV. B42C11/00
Y	FR 2 898 540 A1 (COUTURIER DIDIER CHARLES PIERR [FR]) 21 September 2007 (2007-09-21) * the whole document *	1,15	

TECHNICAL FIELDS SEARCHED (IPC)

B42C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 June 2010	Louvion, Bernard

CATEGORY OF CITED DOCUMENTS

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08-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4038961 A1	11-06-1992	NONE	
FR 2898540 A1	21-09-2007	NONE	

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