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

(11) EP 1 481 777 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.12.2004 Bulletin 2004/49

(51) Int Cl.[7]: **B26D 7/06**

(21) Application number: **04008724.9**

(22) Date of filing: **13.04.2004**

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

(30) Priority: **26.05.2003 IT MI20031050**

(71) Applicant: **Paper Converting Machine Company Italia S.p.A.**
55020 Diecimo - Borgo a Mozzano (Lucca) (IT)

(72) Inventors:
- **Casella, Sergio**
  55026 Loc. Fornili-Barni di Lucca (LU) (IT)
- **Biagioni, Mauro**
  55017 S. Pietro a Vico (LU) (IT)

(74) Representative: **Petruzziello, Aldo et al**
Racheli & C. S.p.A
Viale San Michele del Carso, 4
20144 Milano (IT)

(54) Roll exit assembly for cutting off machine

(57) In a cutting-off machine (10) a roll exit assembly (1) comprises a conveyor (50) to convey towards a discharge rolls of sheet material (3) obtained by transverse cutting of large-sized logs (30). The conveyor (50) comprises a pair of chains (60) supported by respective support means (66, 52, 53, 55) mounted slidably on linear guides (56) integral with the frame (51) of the machine, so as to be able to translate linearly to adjust the distance between the chains (60) according to the diameter and to the disposition of the rolls (3) to be conveyed.

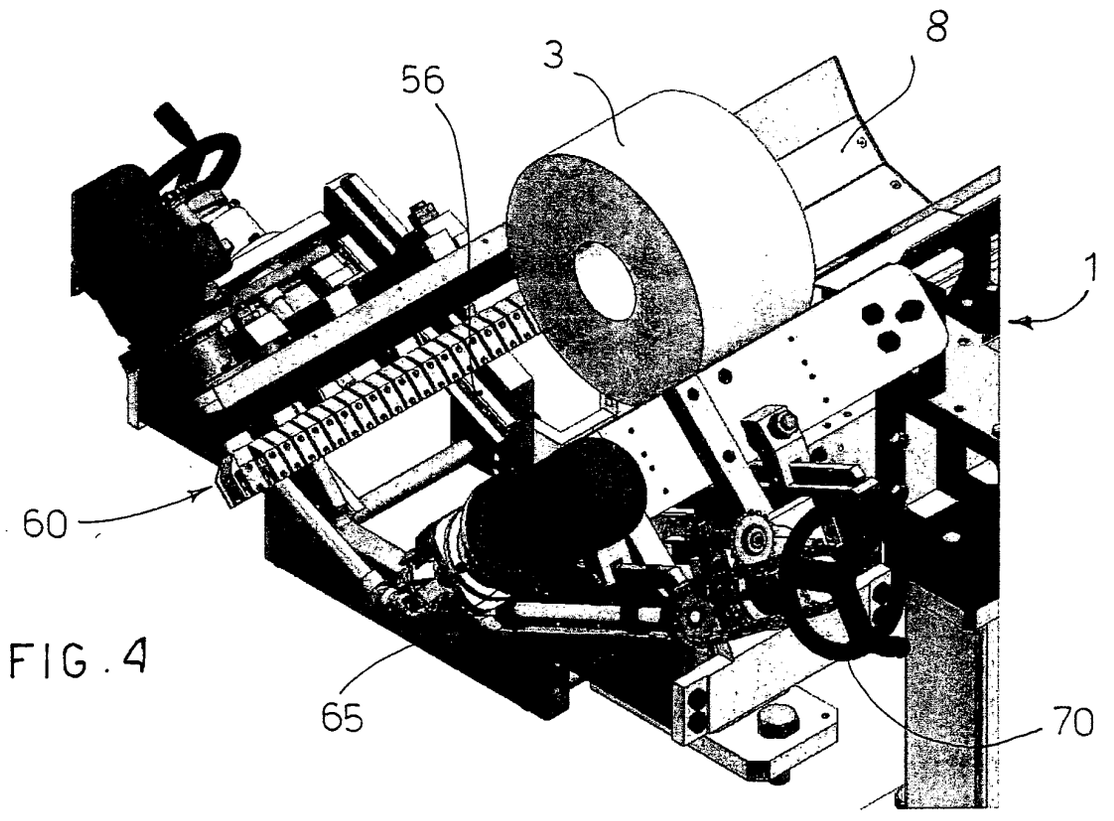


FIG. 4

EP 1 481 777 A2

Description

[0001] The present invention relates to a roll exit assembly for a cutting off machine for the transverse cutting of rolls of sheet material, such as paper, starting from large-sized logs.

[0002] The roll exit assembly serves to remove cut rolls from the cutting area. The log of paper to be cut is made to advance on the cutting off machine bench by means of a pusher towards a cutting disc, as described in European patent application EP0970784 in the name of the same applicant. The advancement of the log, under the action of the pusher, pushes the cut roll onto a roll discharge belt whilst the trimming or end waste is pushed directly by the pusher.

[0003] Figure 1 illustrates a roll exit assembly 101 according to the prior art destined to be disposed downstream of a conveying bed 102 of a cutting off machine. In this manner, rolls 103 of sheet material, obtained by transverse cutting of a log, are fed toward the roll exit assembly 101 by means of a pusher 104 moved along the conveying bed 102 of the cutting off machine.

[0004] With reference also to Figure 2, the roll exit assembly 101 comprises a belt conveyor having two flat belts 105 and two belts 106 with a circular section. The flat belts 105 allow conveying of rolls in a vertical or raised position (not shown in Figures 1 and 2), that is to say with the axis of the roll at right angles to the conveying surface, whilst the belts 106 with a circular section, as shown in Figures 1 and 2, allow conveying of rolls 103 in a horizontal or lying position, that is to say with the axis of the roll parallel to the conveying surface.

[0005] Said roll exit assembly 101 according to the prior art presents many drawbacks.

[0006] The distance between the two circular section belts 106 is fixed, with the consequent limitation of the minimum and maximum diameters of the roll 103 to be conveyed, according to the distance between said belts. In fact, small diameter rolls sink too deep between the belts, whilst large diameter rolls are not gripped adequately.

[0007] When the pusher 104, in order to make the return stroke, rotates around the pinion which transmits drive to the belts, if the roll exit assembly 101 does not carry out an efficient and rapid evacuation of the trimming, impact of the pusher with the last trimming may occur. For this reason, both the pusher 104 and the arm that supports the cutting disk are stopped for the time necessary for removal of the trimming from the range of the pusher 104.

[0008] The width of the pusher 104 is limited by the distance between the two circular section belts 106 and this does not allow an adequate surface for pushing and pressing the log, especially in the case of large diameter logs.

[0009] Because of the small width of the pusher 104, the end trimmings of the rolls with a high diameter/height (transverse measurement/axial measurement) ratio can rotate around the pusher 104 in the cutting area because of the friction between the log and the pressers (elements for blocking the log in the cutting area) during advancement of the log and/or because of the stress exerted by the cutting disk on the log during cutting.

[0010] Furthermore, a height difference is generated between the log on the conveying bench 102 of the cutting off machine and the roll 103 on the roll exit assembly 101. The difference varies with the diameter of the roll and will be greater for small diameter rolls and smaller for large diameter rolls.

[0011] The object of the present invention is to eliminate the drawbacks of the prior art by providing a roll exit assembly for a cutting off machine that is versatile and able to work with rolls of different diameters and formats.

[0012] Another object of the present invention is to provide a roll exit assembly that is highly reliable and able to avoid risks of jamming of the machine.

[0013] Yet another object of the present invention is to provide a roll exit assembly that is able to allow continuous high-speed production, without the need to stop components of the machine.

[0014] These objects are achieved in accordance with the invention with the characteristics listed in appended independent claim 1.

[0015] Advantageous embodiments of the invention are apparent from the dependent claims.

[0016] The roll exit assembly according to the invention comprises a conveyor consisting of two chains, belts or other conveying means which may support inserts of aluminium, Teflon or other material, of a suitable shape to grip the roll in a vertical or in a horizontal position.

[0017] The chains are mounted on supports which can translate along a straight line, so as to keep constant the angle formed between the contact surfaces of the inserts of the two chains and to adapt the gripping width according to the diameter of the roll. The two chains thus form an ideal V-shaped support to accommodate the roll. The angle of opening of this V-shaped support is identical to that of the support bench of the cutting off machine. Thus, a height difference between the log on the bench and the roll on the exit assembly is avoided.

[0018] This exit assembly according to the invention presents various advantages:

- The possibility of carrying out adjustment of the distance between the chains so as to achieve ideal gripping and discharge of the roll.
- An increase in the range of roll diameters that can be conveyed.
- The possibility of installing pushers of a width optimal for the diameter of the roll in production. Problems of incorrect pushing and the possibility that the roll might rotate around the pusher in the cutting area because of the friction between the log and the pressers during feeding of the log and/or because

of the stress exerted on the log by the cutting disc during cutting are thus eliminated.

- It is not necessary to stop the pusher to ensure evacuation of the roll by the exit assembly since the optimal gripping of the roll by the inserts allows a rapid discharge thereof by simple adjustment of the speed of the chains (which is greater than that of the pusher).
- The height difference between the log on the bench and the roll on the exit assembly is eliminated by means of the translation and the adjustment of the chains and a greater stability of the roll in the passage from the cutting off machine bench to the roll exit assembly is thus achieved.

[0019] Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the appended drawings, in which:

- Figure 1 is a partially broken off perspective view illustrating a roll exit assembly according to the prior art disposed downstream of a cutting off machine, in which the cutting assembly has been omitted;
- Figure 2 is a cross sectional view of the roll exit assembly of Figure 1;
- Figure 3 is a perspective view, partially illustrating a cutting off machine provided with a roll exit assembly according to the invention;
- Figure 4 is an enlarged view of a detail of the roll exit assembly of Figure 1, in the situation of conveying a roll disposed horizontally with the axis parallel to the conveying surface;
- Figure 4a is a view like that of Figure 4, but in the situation of conveying a roll disposed vertically with the axis at right angles to the conveying surface;
- Figure 5 is a perspective view of the exit assembly of Figure 4 seen from the rear;
- Figure 6 is an enlarged, partially broken off, cross sectional view of the exit assembly of Figure 4;
- Figure 6a is a view like that of Figure 6, but illustrating the situation in which the roll is disposed vertically;
- Figure 7 is a longitudinal sectional view of the roll exit assembly of Figure 4;
- Figure 8 is a view like Figure 7, but illustrating the condition of rotation of the pusher when it reaches the end of the working stroke;
- Figure 9 is a perspective exploded view of a support frame and of a conveyor chain forming part of the conveyor of the roll exit assembly according to the invention;
- Figure 10 is a perspective view illustrating the assembled conveyor of the roll exit assembly according to the invention.

[0020] Figure 3 illustrates partially a cutting off machine, indicated as a whole with reference numeral 10. The cutting off machine 10 comprises a conveying bench 2, a cutting assembly 20 and a roll exit assembly 1.

[0021] A log 30 of large length is conveyed on the conveying bench 2 towards the cutting assembly 20. The cutting assembly 20 comprises an arm 21 supporting a rotating disc 22 to perform the transverse cutting of the log 30 into rolls of smaller length.

[0022] As shown in Figures 4, 5 and 7, the roll 3 obtained by cutting the log 30 is pushed, by means of pushers 4, towards the roll exit assembly 1 which, by means of a conveying system 50, is responsible for conveying the rolls 3 towards roll discharge means. Movement of the pushers 4 takes place by means of a chain transmission in a per se known manner.

[0023] Coming back to Figure 3, the roll exit assembly 1 comprises a base frame 40 supported by feet 41 and disposed downstream of the cutting assembly 20. The base frame 40 supports the conveying system 50 and a conveyor belt 42 disposed downstream of the conveying system 50 to allow the discharge of the rolls 3 from the cutting off machine 10.

[0024] As shown better in Figures 9 and 10, the conveying system 50 comprises a support frame 51 to be mounted fixedly to the base frame 40. On the sides of the support frame 51 there are provided two transmission track chains 60, disposed longitudinally and parallel to each other.

[0025] Obviously, other conveying and drive transmission means - such as belts and the like-able to support the cut rolls can be provided instead of the chains 60.

[0026] On the links or on the tracks of the chains 60 there are mounted inserts 61 of a material such as Teflon, aluminium, polizene or other material having a different coefficient of friction, depending upon the product to be removed.

[0027] Each chain 60 is supported by two pinions 62 and 63. The first pinion 62 is shrunk on a shaft mounted idly in a plate 66 carrying the chain 60. The second pinion 63 is shrunk on a drive shaft 64 set in rotation by an electric motor 65 disposed beyond the chain-carrying plate 66.

[0028] It should be noted (Figure 6) that each insert 61 has, towards the outside, a first face 61a substantially parallel with respect to a plane passing through the axes of rotation of the pinions 62 and 63 and a second face 61b substantially oblique with respect to said plane passing through the axes of rotation of the pinions 62 and 63.

[0029] The support frame 51 has on each side a pair of support brackets 52 disposed obliquely with respect to a horizontal plane and converging with each other. The chain-carrying plates 66 are mounted on the respective support brackets 52 of the frame 51. In this manner the flat faces 61a of the inserts 61 of the chains are disposed obliquely with respect to a horizontal plane

and diverge from each other, so as to form a substantially V-shaped seat able to receive the rolls 3 in a horizontal position. On the other hand, the oblique faces 61b of the inserts are disposed along a plane substantially parallel to the horizontal plane to receive the edges of a roll disposed vertically.

[0030] Coming back to Figure 9, the support frame 51 has a fixed structure comprising two sides 54 connected to a front crossbar 57. Two rear crossbars 58 are connected to the respective sides 54. To strengthen the fixed structure, two rods 59 connect the respective rear crossbars 58 to the front crossbar 57.

[0031] Two movable structures are mounted on this fixed structure. Each movable structure consists of two support brackets 52, of an abutment plate 53 and of two slides or shoes 55. The shoes 55 are mounted slidably in a pair of grooved guides 56 integral with the front crossbar 57 and with the rear crossbars 58 of the support frame 51. In this manner each abutment plate 53 is maintained parallel to the respective side 54. The grooved guides 56 are substantially oblique with respect to a horizontal plane.

[0032] In each side 54 there is mounted a handwheel 70 which sets in rotation a screw 71 which passes through the respective side 54 to engage in a nut-screw formed in the abutment plate 53 of the mobile structure. In this manner, by turning the handwheel 70, the screw 71 which screws into the nut-screw of the abutment plate 53 is set in rotation. Thus the shoes 55, which are integral with the abutment plate 53, slide linearly in the respective guides 56. As a result, the support brackets 52 move along a trajectory imposed by the guides 56.

[0033] Since the chain-carrying plates 66 are integral with the respective pairs of brackets 52, by operating the handwheels 70 the distance between the chains 60 can be adjusted so as to adapt the conveying system 50 to the different diameters of the rolls 3 to be conveyed. With this system rolls 3 with diameters ranging from 90 mm to 350 mm can be conveyed.

[0034] The movement of the chain-carrying plates 66 is synchronised. For this purpose, a pulley 73 which draws a respective belt 74 into rotation is shrunk on the shank of each screw 71. The belt 74 in turn sets in rotation another pulley 75 provided at the end of a synchronisation shaft 76. At the other end of the synchronisation shaft 76 there is provided a gear 77 which meshes with a corresponding gear 77 or with an universal joint of the other synchronisation shaft 76. In this way, by turning one of the two handwheels 70, the two chain-carrying plates 66 are moved synchronously and at the same time.

[0035] Obviously, in place of the manual adjustment system, consisting of the two handwheels 70, for adjusting the distance between the chains 60, an automatic adjustment system, such as an electric motor that sets the screw 71 in rotation could be provided, or an actuator that pushes the mobile structure could be provided in place of the screw and nut-screw system.

[0036] The motors 65 that set the respective chains 60 in motion are synchronised with each other by means of a suitable inverter actuator, so as to allow synchronous rotation of the chains 60.

[0037] Obviously, a single motor and drive transmission means to transmit the drive to both chains 60 can be provided instead of the two motors 65.

[0038] In any case the speed of advancement of the chains 60 is controlled so as to be greater than the speed of advancement of the pushers 4 to allow a rapid removal of the rolls 3 from the area of rotation of the pushers 4.

[0039] As shown in Figures 4, 5, 6, the bench for conveying rolls 2 leaving the cutting assembly 20 has a cradle-shaped support guide 8 obtained by means of suitably inclined metal plates. As can be seen clearly in Figure 6, thanks to the above-mentioned distance adjustment system, the chains 60 are adjusted in position, so that the front face of the inserts 61 is kept in register with and substantially parallel to the plane of the guide metal plates 8. In this manner the passage of the roll 3 from the guide 8 of the conveying bench to the chains 60 of the conveying system 50 of the exit assembly 1 is facilitated.

[0040] Furthermore, as shown in Figures 4a e 6a, the conveying system 50 of the roll exit assembly 1 is particularly suitable for also conveying rolls 3 in the vertical position, that is to say with the axis of the roll at right angles to the conveying surface. In fact, in this case the edges of the roll 3 rest on the oblique faces 61b of the inserts 61 of the chains.

[0041] Furthermore, as shown in Figures 7 and 8, the pusher 4 consists of a plate supported by a flange 90 mounted on a carriage 91 slidable in guides 93 of the conveying bench. The front end of the conveying bench 2 ends in register with the front end of the cradle-shaped guide 8. Therefore the pusher 4, when it reaches the front end of the conveying bench 2, that is to say at the end of its working stroke, pushes the roll 3 between the chains 60 of the roll exit assembly to begin rotation and its return stroke.

[0042] As a result, the chains 60, which have a higher speed with respect to that of the pushers 4, pull the roll 3. Therefore, as shown in Figure 8, when the pusher 4 begins its rotation at the end of the conveying bench 2, the roll 3 is already at such a distance as not to interfere with the pusher 4.

[0043] Furthermore, thanks to the system for adjusting the distance of the chains 60, the pushing plate of the pusher 4 can be chosen sufficiently wide to be able to pass in the space between the two chains 60. In this manner a larger surface for pushing the log 30 is ensured.

[0044] Even if specific reference has been made in the present description to the chains 60 and to the inserts 61 mounted on the chains, the invention is not limited to said embodiment. In fact, the inserts 61 are optional and can therefore be omitted. Furthermore, the

chains 60 can be replaced by other conveying means, such as, for example, belts and the like.

Claims

1. A roll exit assembly (1) for a cutting-off machine (10) comprising a conveyor (50) to convey towards a discharge rolls of sheet material (3) obtained by transverse cutting of large-sized logs (30), **characterised in that** said conveyor (50) comprises a pair of conveying means (60) supported by respective support means (66, 52, 53, 55) mounted slidably on linear guides (56) integral with the frame of the machine, so as to be able to translate linearly to adjust the distance between said conveying means (60) according to the diameter and to the disposition of the rolls (3) to be conveyed.

2. A roll exit assembly (1) according to claim 1, **characterised in that** said conveying means comprise a pair of chains (60).

3. A roll exit assembly (1) according to claim 2, **characterised in that** inserts (61) of material - such as aluminium, Teflon, polizene and the like - having a coefficient of friction suited to the roll to be conveyed are fixed to the tracks of said chains (60).

4. A roll exit assembly (1) according to claim 3, **characterised in that** said inserts (61) have, in their outward facing part, a first face (61a) parallel to a plane passing through the axes of rotation of the chain (60) and a second face (61b) oblique with respect to said plane passing through the axes of rotation of the chain (60).

5. A roll exit assembly (1) according to any one of the preceding claims, **characterised in that** said conveying means (60) are driven in rotation by means of respective independent motorizations (65) synchronised with each other.

6. A roll exit assembly (1) according to any one of claims 1 to 4, **characterised in that** said conveying means (60) are driven in rotation by means of drive transmission means actuated by a single motorization.

7. A roll exit assembly (1) according to any one of claims 2 to 6, **characterised in that** said chain (60) is mounted on a first idle pinion (62) and on a second motorised pinion (63), wherein both pinions are supported rotatably by said support means (66).

8. A roll exit assembly (1) according to any one of the preceding claims, **characterised in that** said support means of the conveying means (60) are driven by means of manually operated or motorized drive means (71).

9. A roll exit assembly (1) according to claim 8, **characterised in that** said drive means comprise a screw (71) - nut-screw coupling system, wherein the screw is mounted rotatably in the fixed frame (51) of the machine and the nut-screw is formed in said support means (66) of the chain (60).

10. A roll exit assembly (1) according to claim 8 or 9, **characterised in that** said drive means (71) of the chain support means are synchronised with each other by means of synchronisation means.

11. A roll exit assembly (1) according to claim 10, **characterised in that** said synchronisation means comprise belt transmissions (74) which take their drive from the respective drive means (71) and transmit it to respective synchronisation shafts (76) which have respective gears or universal joint (77) meshing with each other.

12. A roll exit assembly (1) according to any one of claims 9 to 11, **characterised in that** said chain support means comprise:

- an abutment plate (53) in which the nut-screw which couples with said screw driving means (71) is formed;
- a pair of shoes (55) integral with the abutment plate (53) and mounted slidably in said guides (56) integral with the fixed frame (51);
- a pair of brackets (52) integral with the abutment plate (53) and disposed obliquely with respect to the shoes (55); and
- a chain-carrying plate (66) fixed to said brackets (52) and supporting the shafts of the pinions (62, 63) of the chain (60).

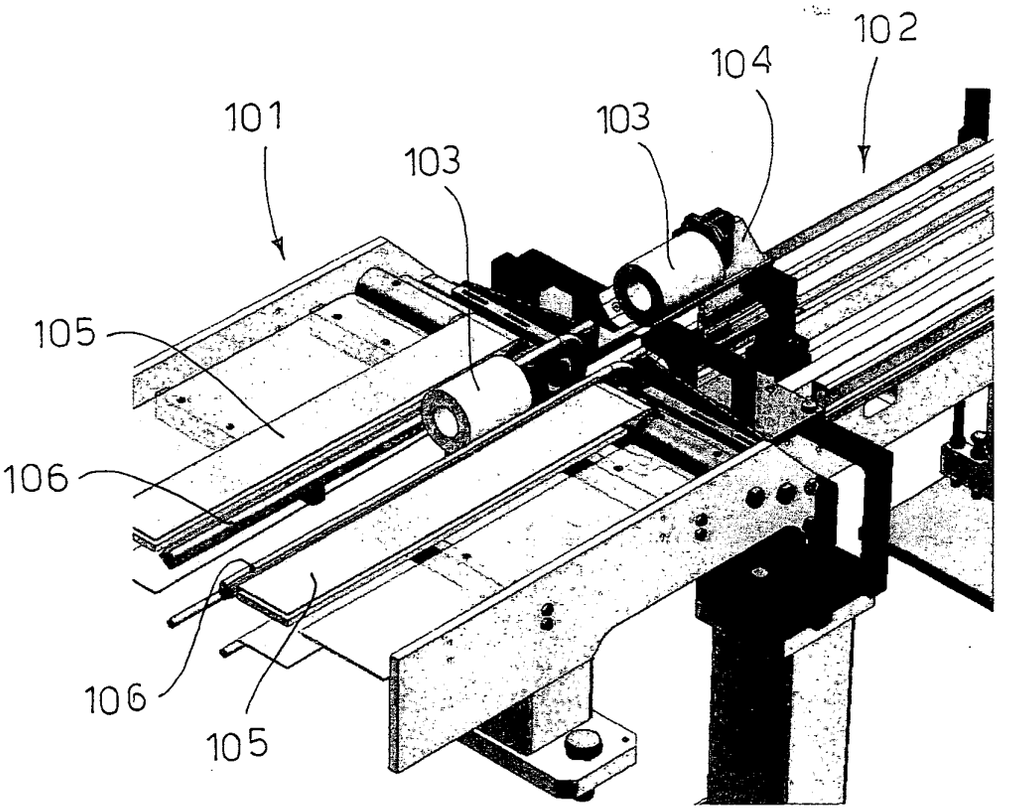
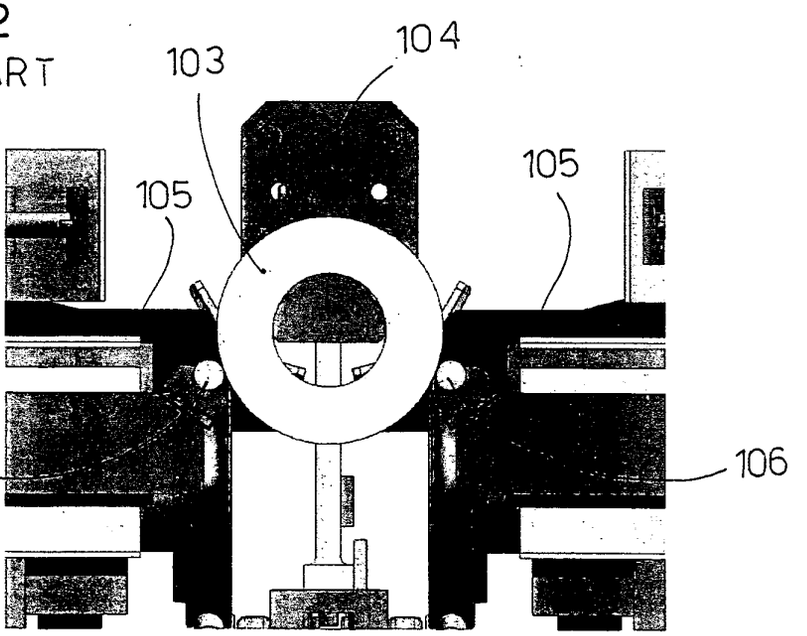


FIG. 1
PRIOR ART

FIG. 2
PRIOR ART



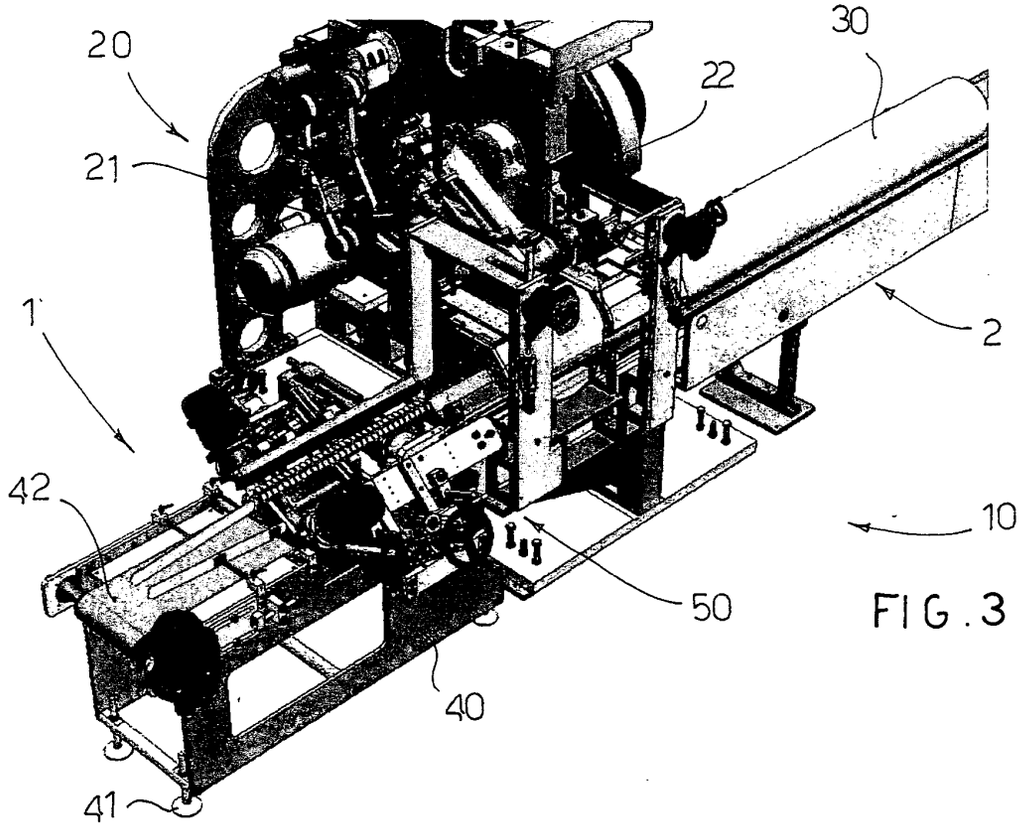


FIG. 3

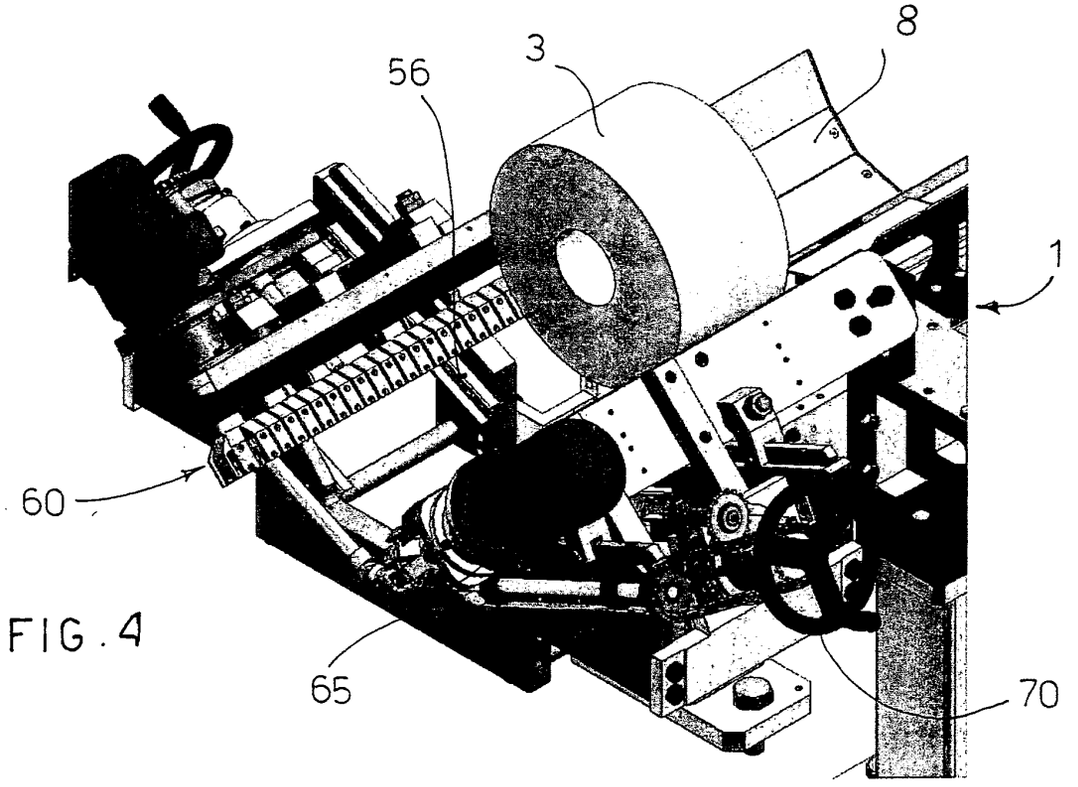


FIG. 4

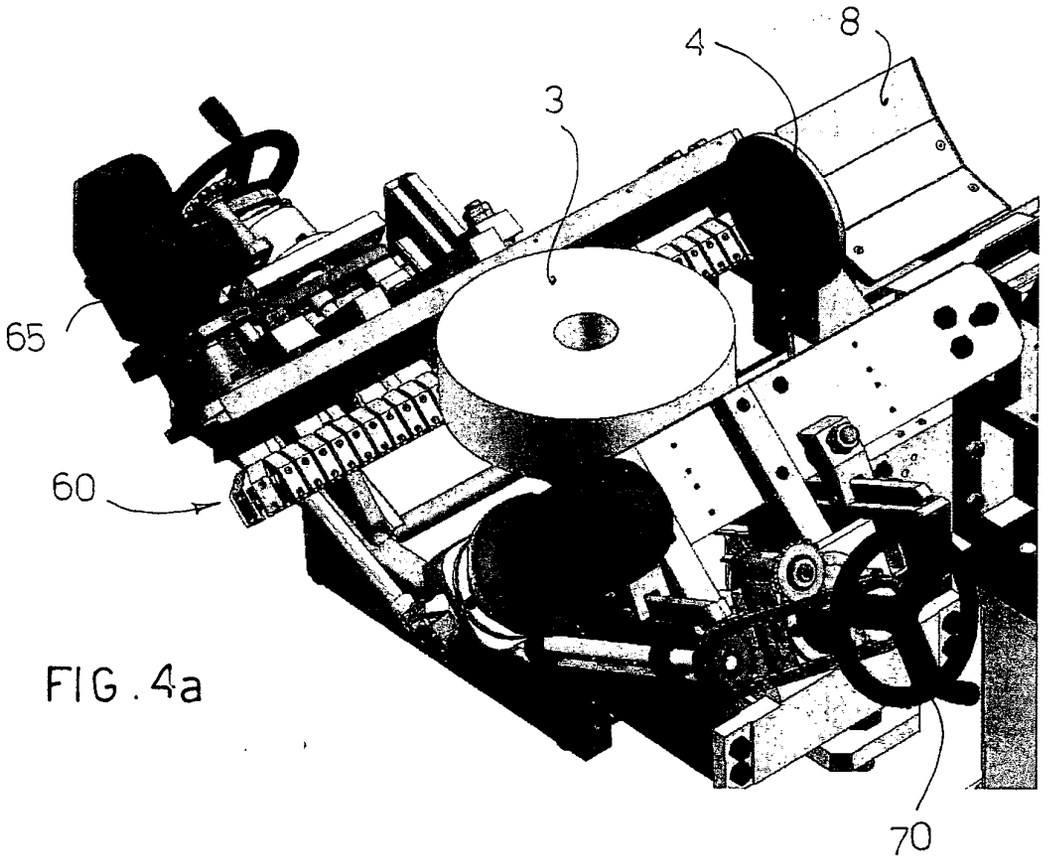
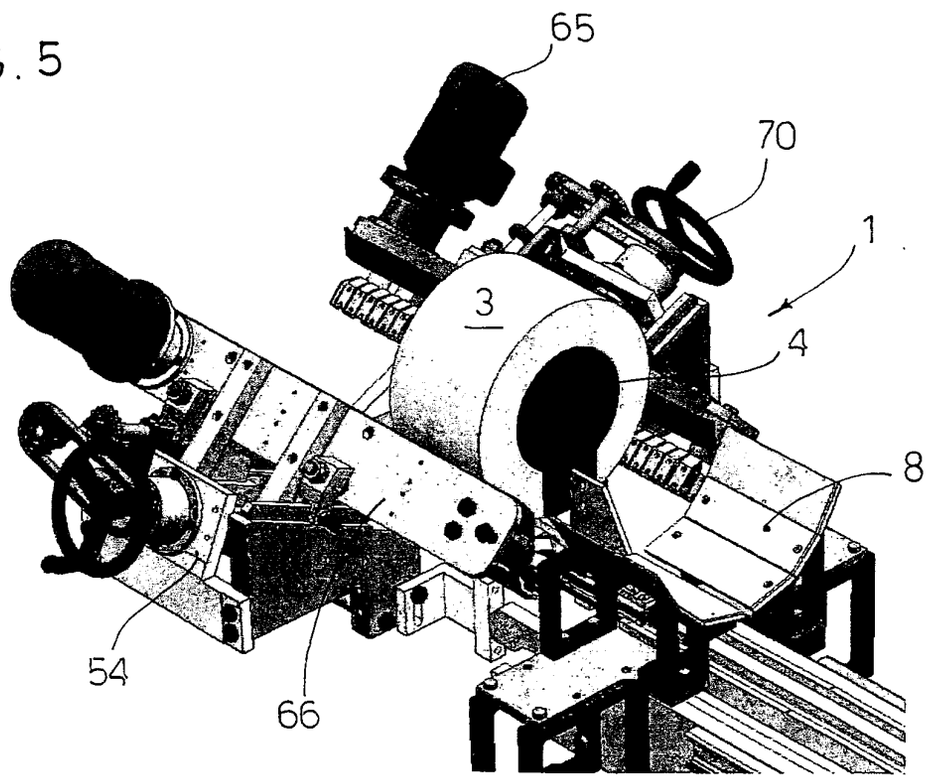


FIG. 4a

FIG. 5



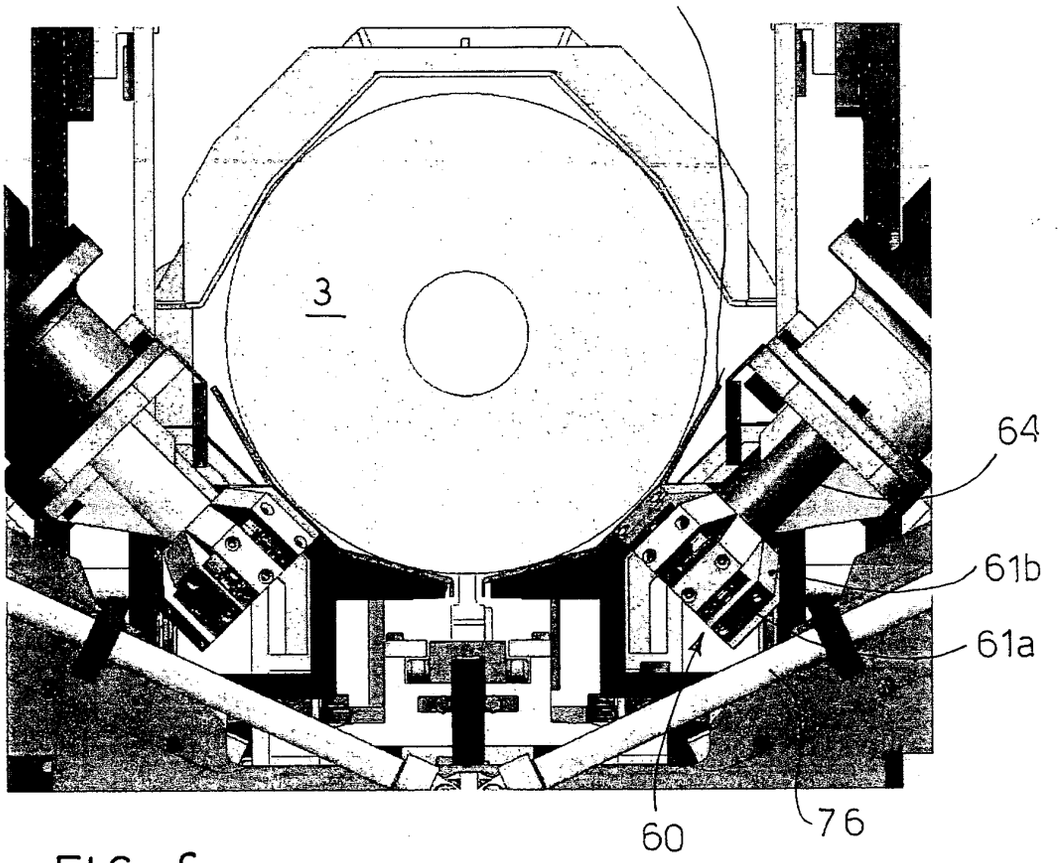
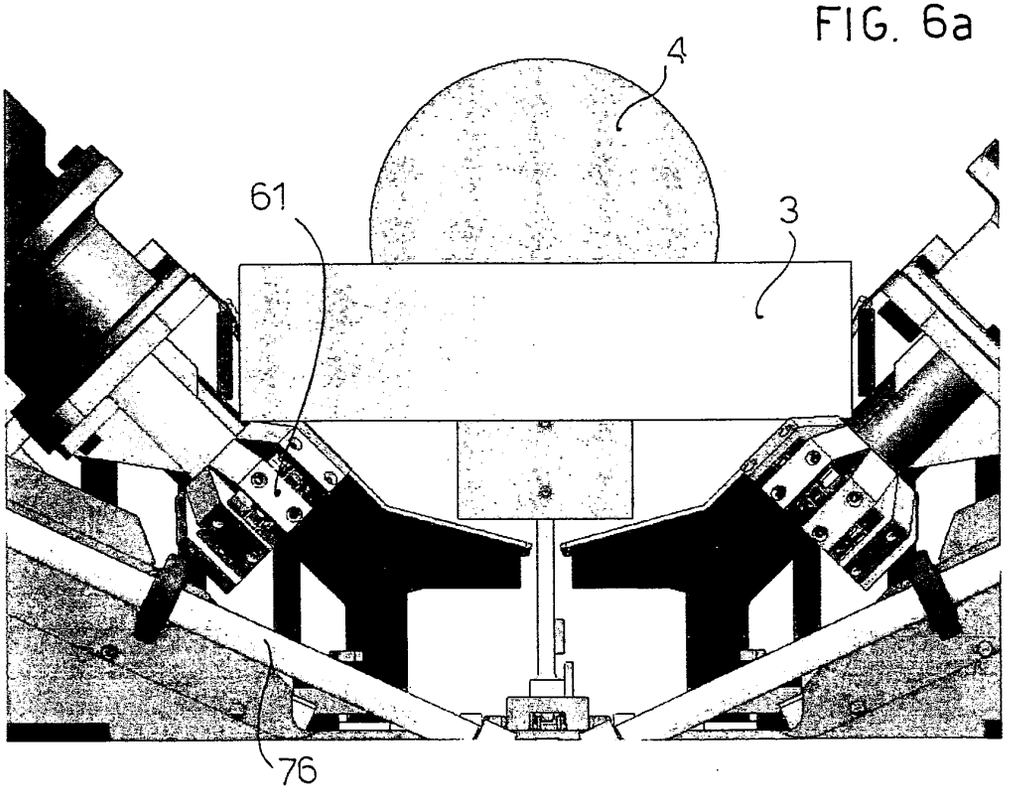


FIG. 6

FIG. 6a



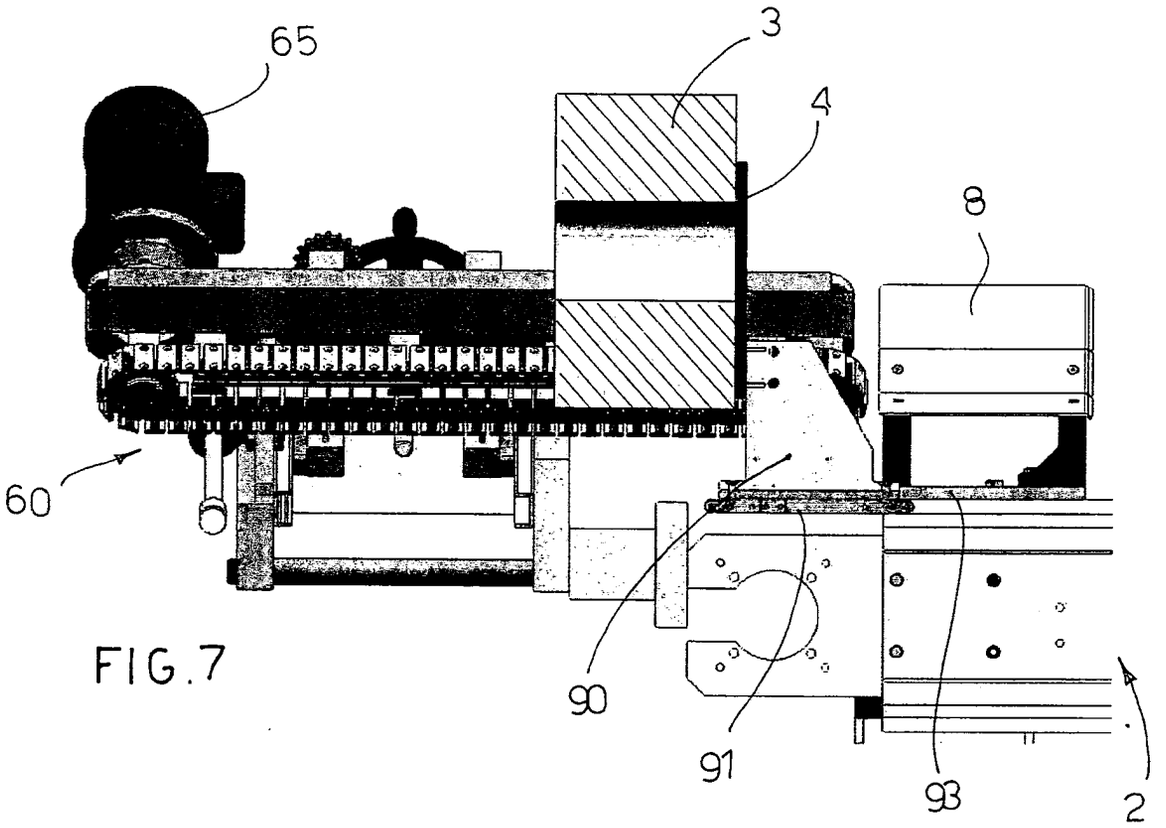


FIG.7

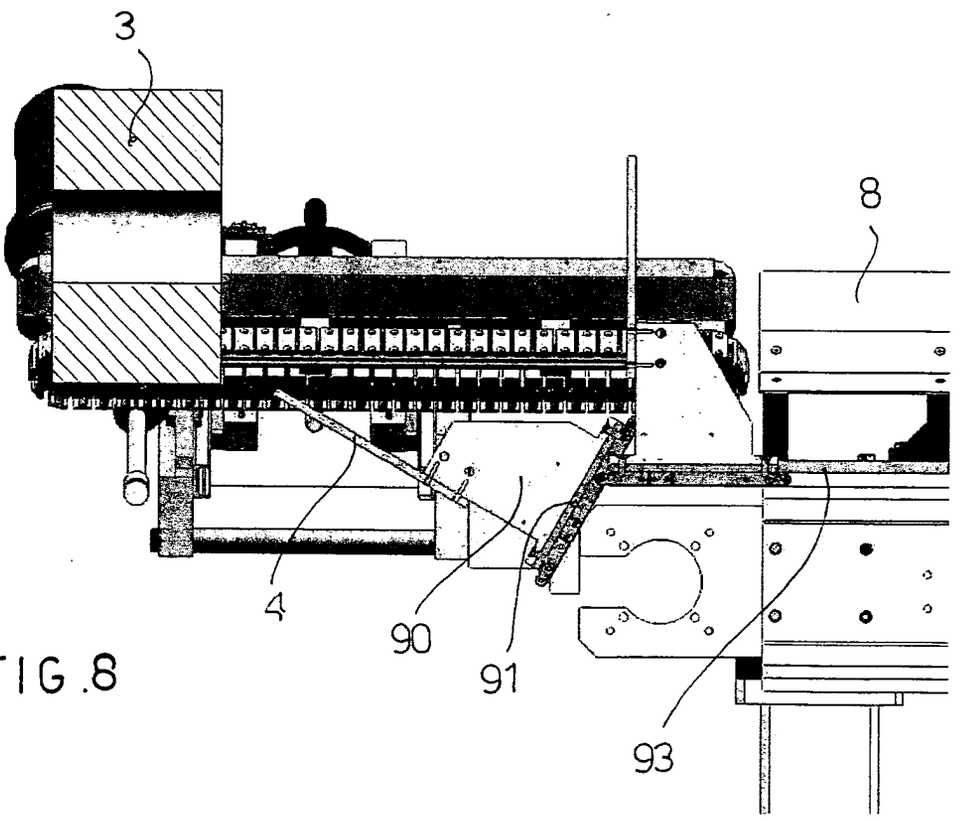
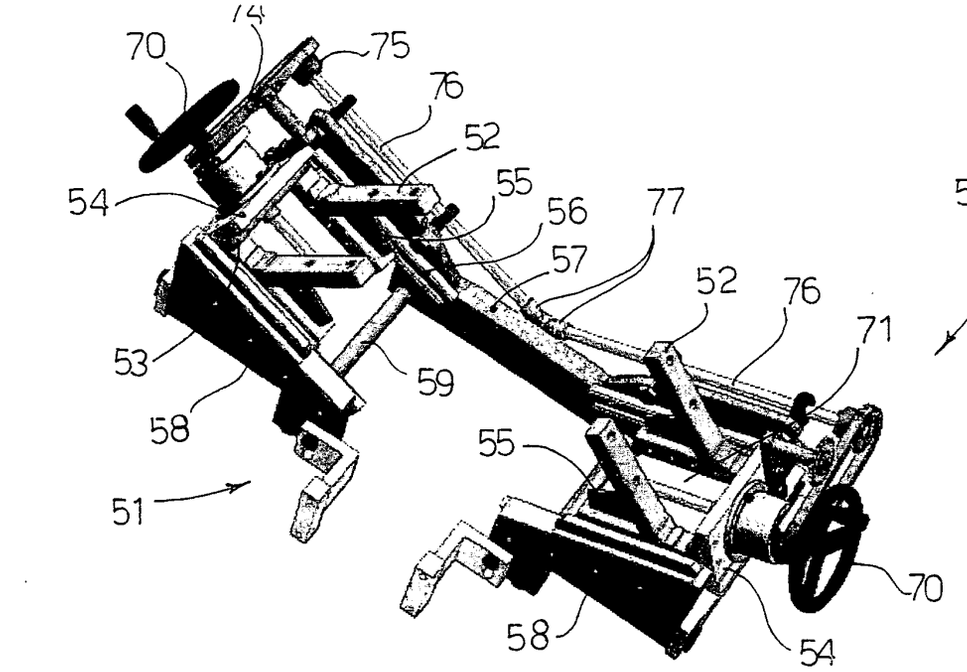


FIG.8


70
74
75
76
52
54
55
56
77
50
57
52
76
71
53
59
58
55
51
70
58
54

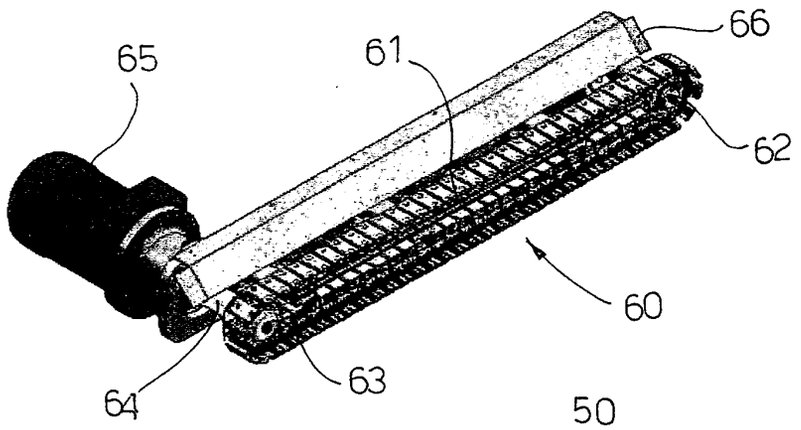

66
65
61
62
60
64
63

FIG.9

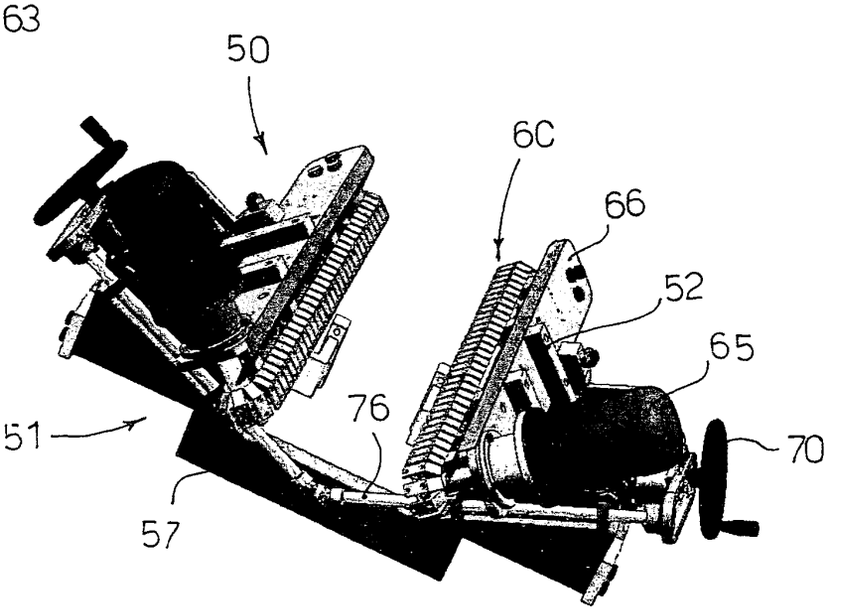

50
60
66
52
65
76
70
51
57

FIG.10