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

(11) EP 1 356 907 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.10.2003 Bulletin 2003/44

(51) Int Cl.[7]: **B27J 5/00**, B26D 3/28

(21) Application number: **03076112.6**

(22) Date of filing: **15.04.2003**

(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 PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **22.04.2002 IT TO20020345**

(71) Applicant: **Italco S.r.l.**
14100 Asti (IT)

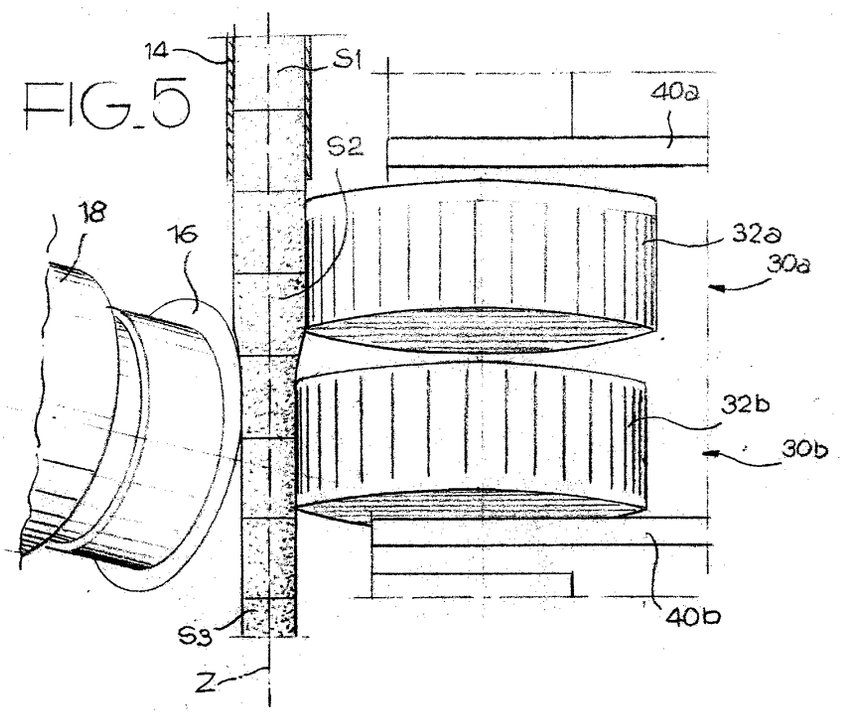
(72) Inventors:
- **Arato, Giovanni**
  14014 Montafia (Asti) (IT)
- **Coppo, Vicenzo**
  15034 Cellamonte (Alessandria) (IT)

(74) Representative: **Saconney, Piero et al**
SACONNEY & CIAN
Corso Vittorio Emanuele II, 14
10123 Torino (IT)

(54) Trueing machine for cork stoppers

(57) A trueing station (12) comprises a circular blade (16) with an axis which is skewed with respect to the axis (Z) of successive stoppers (S1, S2, S3). A pair of assemblies (30a, 30b) is provided in the station (12) for driving and centering the stoppers, a first of which (30a) is located immediately before the circular blade (16), and a second of which (30b) is located immediately after the circular blade (16). Each assembly (30a, 30b) comprises a set of three rotary members which engage the stoppers (S1, S2, S3) according generatrices arranged like the vertexes of a triangle. One of the rotary members of each assembly is a driving wheel (32a, 32b), having an axis inclined with respect to the axis (Z) of the stoppers, which drives the stoppers into rotation around their axis (Z) and feeds them onwards. The other two rotary members are idle pressure rollers. The three rotary members are interconnected by a respective self-centering linkage in such a manner that in the trueing station (12) the axis (Z) of each stopper (S1, S2, S3) remains the same before, during and after the trueing.

FIG.5



EP 1 356 907 A2

Description

[0001] The present invention relates to a trueing machine for cork stoppers according to the preamble of claim 1.

[0002] The invention has been conceived in its application to the trueing of agglomerated cork stoppers and of glued stoppers, but is also applicable to the trueing of natural cork stoppers.

[0003] Agglomerated cork stoppers are cylindrical bodies of a material constituted by milled cork grains bonded by a suitable adhesive.

[0004] Glued stoppers are composite stoppers constituted by a main cylindrical component or body of agglomerated cork, which has at least one disc of valuable natural cork glued to at least one of its ends.

[0005] Both agglomerated cork stoppers, such as those produced in suitable moulds or by extrusion, and glued stoppers, such as those produced by disc glueing machines, as well as natural cork stoppers, such as those obtained by the dinking of cork barks, do not have the prescribed nominal diameter and have a rough surface texture; actually they are semifinished products which require a finishing or calibrating step called trueing or turning.

[0006] A machine known from a long time, account of which is given in the preamble of claim 1, is similar to a lathe in which every single stopper, while it is rotated around its axis, is turned between centres by means of a circular blade whose peripheral cutting edge tangentially engages the periphery of the stopper.

[0007] This known machine, which is of the handicraft kind and demands skilled, and therefore expensive, labour, has a low productivity which is due to the idle times which correspond to the substitution of every single stopper between the centres. This machine is therefore quite inadequate to the present production rates, if only one thinks that some modern machines for the production of raw glued stoppers can reach a production rate of some thousand of stoppers per hour.

[0008] For that reason, such machine has been abandoned in favour of machines in which the tool is an abrasive disc or an abrasive tape which operates like the centreless grinding machines for metal workpieces.

[0009] However, the latter machines, which allow to obtain stoppers with smooth surfaces of good quality, have the drawback to produce cork dust polluted by abrasive grains.

[0010] A continuous machine is also known, which avoids both the aforesaid idle times and the aforesaid pollution due to abrasive, but which can be used only for the trueing of cylindrical agglomerated cork bars, before these bars are severed into sections each having the length of a finished stopper.

[0011] The known continuous machine, in which the tool is still a circular blade and in which the bar is fed in the axial direction, solves the problem to drive the piece into rotation, the rotation being obtained by means of rollers.

[0012] The main object of the invention is to provide a trueing machine for cork stoppers which has the advantageous characteristics of the aforesaid continuous machine, but which can be used for the continuous trueing of single stoppers.

[0013] According to the invention this object is attained by means of a machine as claimed.

[0014] Thanks to the claimed solution, a machine according to the invention allows to obtain, through the trueing station, a continuous flow of stoppers which are driven into rotation one after the other around their axis.

[0015] Each stopper which reaches the trueing station from the feeding conduit is first seized and centered by the set of three rotary members of the first assembly, which is immediately upstream of the circular blade, and is driven into rotation around its axis and fed onwards by the corresponding driving wheel.

[0016] Once the rotating stopper has been seized and centered, it is engaged by the circular blade which removes a layer of a predetermined thickness all over its length. The trued portion is then introduced between the rotary members of the set of three members of the second assembly, which is immediately downstream of the blade.

[0017] Thanks to the adjustment of the rotary members of the second assembly, which takes account of the reduction of diameter of the stopper due to the trueing, the stopper remains centered on the same axis as before and continues to be driven into rotation and to be fed onwards, this time by the driving wheel of the second assembly.

[0018] The invention will be better understood from the reading of the detailed description which follows, made with reference to the attached drawings, given by way of not limiting example, and in which:

figure 1 is a plan view from above of a machine according to a preferred embodiment of the invention,

figure 2 is a lateral elevational view thereof according to the arrow II of figure 1,

figure 3 is a partial front view thereof in the plane indicated with III-III in figure 2,

figure 4 is a partial cross-section in the plane indicated with IV-IV in figure 1,

figure 5 is a partial side view according to the arrow V of figure 3, and

figure 6 is a vertical cross-section according to the line VI - VI of figure 2.

[0019] Referring to figures 1 and 2, the machine shown comprises a bench B which supports a fixed horizontal table 10 and a structure which defines a trueing

station, generally indicated 12.

[0020] A tubular feeding conduit 14, which can be better seen in figures 3 and 5, extends above the table 10 and comes from a feeder of raw stoppers to be trued, indicated S1, for example from a vibrating hopper (not shown).

[0021] Preferably, as shown, the feeding conduit 14 and the axis of the stoppers S1, indicated Z in figure 5, are vertical and the feeding of the stoppers in the conduit 14 takes place by gravity.

[0022] The conduit 14 has a lower end which opens onto an upper region of the trueing station 12.

[0023] The arrangement of the trueing station 12 is more clearly shown in figures 3, 5 and 6.

[0024] A circular blade 16, located in the trueing station 12, is carried and rotated by the shaft of an electric motor 18.

[0025] As will be better clarified below, the cutting edge of the blade 16 engages the peripheral surface of the successive raw stoppers S1 which come down from the conduit 14 in order to remove a layer of a predetermined thickness from the stoppers, as shown for the stopper S2, transforming them into finished stoppers, indicated S3.

[0026] After the trueing step, the stoppers S3 fall into an underlying conduit, not shown, which leads to a receptacle or a conveyor belt.

[0027] The axis of the circular blade 16, indicated A in figures 1 and 2, is askew with respect to the axis of the successive stoppers S1, S2, S3, in order to obtain that, while the stoppers are fed downwards, a layer of cork is removed from their surface in the form of a helical chip, which may be discontinuous in the most frequent case of the trueing of agglomerated stoppers.

[0028] Preferably, the circular blade 16 is provided with a peripheral cutting portion of a sintered agglomerate of tungsten, molybdenum or tantalum carbides, with cobalt as a binder, such as Widia®.

[0029] The use of a material such as Widia® or an equivalent material does not seem to be known in the application to the trueing of cork stoppers, for which use was made of circular blades with a cutting edge of special steel which required frequent regrindings, to the point that the trueing machines themselves were equipped with a regrinding device to restore the cutting edge after the trueing of some hundreds of stoppers.

[0030] It has been found that with the use of a circular blade 16 with a cutting edge of Widia® or an equivalent material, sharpening of the cutting edge is necessary after the trueing of a number of stoppers of the order of 800,000.

[0031] The abrasive discs and tapes according to the prior art produced stoppers of agglomerated cork with ground surfaces which showed craters with "torn out" edges which were anything but suitable to guarantee a perfectly tight seal of the stoppers in the necks of the bottles.

[0032] It has also been found that the use of a circular blade with a cutting edge of a material such as Widia® allows instead to obtain trued surfaces of agglomerated cork that, as different from the prior art, show craters with very neat edges thanks to which these craters behave as many suction cups vis-à-vis the glass of the neck of the bottle, to all advantage of the tightness of the seal.

[0033] The trueing with a circular blade avoids the disadvantage of the production of cork dust polluted by abrasive grains. Indeed, the scraps are in the form of chips which can be reused for the production of articles of agglomerated cork.

[0034] Referrig again to figures 1 and 2, preferably the electric motor 18 of the circular blade 16 is carried by a slide 22 which can be micrometrically moved towards the stoppers S1, S2, S3 and in the opposite direction by means of a handwheel 24 for adjusting the cutting depth of the blade 16.

[0035] A platform 26 is interposed between the slide 22 and the motor 18 and can be adjusted by means of a handwheel 28 in order to bring back the circular blade 16 to the tangent cutting position after each sharpening.

[0036] Referring now more particularly to figures 2, 3, 5 and 6, the trueing station 12 comprises a pair of assemblies for driving and centering the stoppers.

[0037] A first assembly or upper assembly, generally indicated 30a, is located immediately before the circular blade 16; a second assembly or lower assembly, generally indicated 30b, is located immediately after the circular blade 16.

[0038] Since, preferably, the parts of the two assemblies, the upper one 30a and the lower one 30b, are identical or substantially such, in the description which follows and in the drawings they are indicated by the same reference numerals followed by the letter a for the upper assembly 30a and by the letter b for the lower assembly 30b.

[0039] The upper assembly 30a is located above and the lower assembly 30b is located under the table 10.

[0040] Each assembly 30a, 30b includes a respective set of three rotary members which engage the stoppers S1, S2, S3, respectively, according to generatrices arranged like the vertexes of a triangle.

[0041] One of these rotary members, 32a and 32b, respectively, is a motorized driving wheel, having an axis which is inclined with respect to the axis Z of the stoppers S1, S2, S3.

[0042] Each driving wheel 32a, 32b drives into rotation the raw stoppers S1 and the finished stoppers S3, respectively, as well as a stopper S2 which is being trued, and is rotated by a respective asynchronous electric motor 34a, 34b (figure 2) in such a direction as to feed the stoppers along their common axis Z.

[0043] The distance between the two driving wheels 32a, 32b in the direction Z is chosen smaller than the length of the stoppers, so as to make sure that a stopper S1 to be trued, a stopper S2 which is being trued, and a stopper S3 which has just been trued are always en-

gaged by the periphery of one of these wheels.

[0044] Each driving wheel 32a, 32b is preferably provided with a rim of a slightly abrasive material in order to ensure the revolving friction for driving the stoppers S1, S2, S3 both into rotation and translation.

[0045] The other two rotary members of each set of three are a pair of idle, cylindrical and smooth, pressure rollers 36a, 36b, respectively, of small diameter, also visible in figure 1.

[0046] The axes of all the pressure rollers 36a, 36b are parallel to the axis Z of the stoppers S1, S2, S3. The axial length, in the direction Z, of the rollers 36a, 36b is substantially equal to the axial height of the respective driving wheel 30a, 30b, so as to make sure that a stopper S1 to be trued, a stopper S2 which is being trued, and a stopper S3 which has just been trued are always engaged also by the pressure rollers 36a and/or 36b.

[0047] The three rotary members 32a, 36a and 32b, 36b of each assembly 30a, 30b are interconnected by a respective self-centering linkage, generally indicated 38a for the upper linkage and 38b for the lower linkage in figure 3.

[0048] Each self-centering linkage 38a, 38b is provided with adjusting means which are so arranged that in the trueing station 12 the axis Z of each stopper S1, S2, S3 remains the same before, during and after the trueing.

[0049] To this purpose, preferably, the motorized driving wheel 32a, 32b of each assembly 30a, 30b is carried by a respective slide 40a, 40b (figure 2) whose position is adjustable, independently from the other slide, in a horizontal direction X, perpendicular to the axis Z of the stoppers S1, S2, S3.

[0050] A device for adjusting the position of the slides 40a, 40b will be described more below.

[0051] Each self-centering linkage 38a, 38b preferably includes (figures 1, 2 and 3) a respective pair of rocking levers 42a, 42b each of which is fulcrumed at 46 on the table 10 around a respective fixed axis which is parallel to the axis Z of the stoppers S1, S2, S3.

[0052] One arm 44a, 44b of each rocking lever 42a, 42b is linked to the respective slide 40a, 40b by a respective connecting rod 48a, 48b of adjustable length, while the other arm 46a, 46b of the lever 42a, 42b carries the respective pressure roller 36a, 36b.

[0053] The levers 42a, 42b of each linkage 38a, 38b are specularly arranged with respect to a median plane containing the axis Z of the stoppers S1, S2, S3 and passing through the centre of the corresponding driving wheel 32a, 32b.

[0054] Referring especially to figure 2, a respective thrust regulator for the respective driving wheel 32a, 32b is associated to the slide 40a, 40b of each assembly 30a, 30b.

[0055] The two thrust regulators, generally indicated 50a and 50b, respectively, are independent from each other.

[0056] Each thrust regulator 50a, 50b includes a respective pneumatic actuator 52a, 52b with a respective piston rod 54a, 54b which is connected to the corresponding slide 40a, 40b in the manner which will be described below, and which biases the slide towards the stoppers S1, S3.

[0057] The two actuators 52a, 52b are fed with compressed air through a common pressure regulator, diagrammatically shown in dotted lines at 55.

[0058] The rod 54a, 54b of each actuator 52a, 52b has associated thereto a respective micrometric adjustment device for adjusting the end position of the corresponding slide 40a, 40b according to the diameter of the raw stoppers S1 and the finished stoppers S3, respectively.

[0059] Figure 2 shows respective handwheels, indicated 56a, 56b, for the micrometric adjustment of the end position of the upper slide 40a and the lower slide 40b, respectively.

[0060] Each handwheel 56a, 56b is fast with a respective toothed crown 57a, 57b having an inner toothing in mesh with the outer toothing of a respective tubular pinion 58a, 58b.

[0061] Each pinion 58a, 58b has an inner thread having the function of a nut, which is in engagement with a corresponding threaded rear section of the rod 54a, 54b of a respective actuator 52a, 52b.

[0062] Therefore, the rotations of the handwheels 56a, 56b in one direction and the other are converted into micrometric linear to-and-fro movements of the piston rods 54a, 54b.

[0063] As will be understood, since the two driving wheels 32a, 32b have the same diameter, if they were rotated at the same angular speed the upper wheel 32a would rotate the raw stoppers S1 at an angular speed lower than that at which the lower wheel 32b rotates the stoppers S3, whose diameter has been reduced by the trueing.

[0064] This difference in rotation speed is undesirable: referring especially to figure 2, each driving wheel 32a, 32b is driven by the respective asynchronous electric motor 34a, 34b through a respective 90° reduction gear 60a, 60b and from an electrical circuit (not shown) which allows the speeds of the two asynchronous motors 34a, 34b to be automatically adjusted in such a manner as to impart to all the stoppers S1, S2, S3 the same speed of rotation before, during and after the trueing.

[0065] Preferably, the inclination of the driving wheels 32a, 32b is adjustable in order to allow to regulate the feed rate of the stoppers S1, S2, S3 according to the requirements.

[0066] The inclined attitude taken by the driving wheels 32a, 32b is better shown in Figure 6.

[0067] A system for adjusting the inclination of the driving wheels 32a, 32b will be now described with specific reference to figure 4, as well as to figure 2 as far as regards the upper components indicated by reference numerals followed by the suffix a.

[0068] Each slide 40a, 40b has a pair of brackets af-

fixed thereto, 62a, 62b, respectively, each of which pairs is supported by a respective horizontal, revolving and sliding shaft 64a, 64b which constitutes an extension of a respective piston rod 54a, 54b.

[0069] Each of the slides 40a, 40b is provided with a respective orthogonal pivot pin 66a, 66b.

[0070] The table 10 carries a lateral turret 68 in which a vertical nut 70 is fixed, which is in engagement with a vertical threaded shaft 72.

[0071] The micrometric rotation of the nut 70 can be obtained, through a bevel gear pair 74, from a handwheel 76.

[0072] Each pivot pin 66a, 66b is connected to the threaded shaft 72 through a respective telescopic connecting rod 78a, 78b.

[0073] One end of each telescopic connecting rod 78a, 78b is articulated to the respective pivot pin 66a, 66b by means of a bushing 80a, 80b, preferably of the ball-type, and its other end is coupled to the threaded shaft 72 by means of a respective ear 82a, 82b.

[0074] Each ear 82a, 82b is imprisoned between two nuts, 84a and 84b, respectively, which prevent them from sliding along the shaft 72.

[0075] The adjusting system of figure 4 allows to adjust in unison the inclination of the two driving wheels 32a, 32b from the handwheel 76; by rotating the handwheel 76 by hand in one direction or the other, the two bushings 80a, 80b and the two pivot pins 66a, 66b are raised and lowered jointly, whereby the respective slides 40a, 40b and the two driving wheels 32a, 32b are rotated in unison, through the respective pivot pins 66a, 66b, according to the double arrows G of figures 4 an 6.

[0076] The possibility of varying of the length of the telescopic connecting rods 78b, 78b and the possibility of rotating the bushings 80a, 80b around the pivot pins 66a, 66b allow to take up the geometric variations of the system due to the adjustment movements imparted to the slides 40a, 40b in the direction X of figure 2.

[0077] Moreover, by modifying the positions of the ears 82a, 82b along the threaded shaft 72 by the manipulation of the nuts 84a, 84b, it is possible to adjust the geometry of the system in such a manner that the two driving wheels 32a, 32b have the same inclination, or different inclinations, if this is deemed convenient.

Claims

1. Trueing machine for cork stoppers, of the type comprising means (32a, 32b) for rotating a stopper around its axis, and a rotating circular blade (16) whose cutting edge engages the peripheral surface of the stopper to remove therefrom a layer of a predetermined thickness,

   characterized in that it comprises:

   - a feeding conduit(14) in which the stoppers (S1) to be trued are fed towards the circular blade (16) in a continuous succession and in axial alignment;
   - a trueing station (12) comprising the aforesaid circular blade (16), which has an axis which is skewed with respect to the axis (Z) of the successive stoppers (S1, S2, S3); and
   - a pair of assemblies (30a, 30b) for driving and centering the stoppers (S1, S2, S3), of which a first assembly (30a) is located immediately before the circular blade (16) and a second assembly (30b) is located immediately after the circular blade (16);
   - **in that** each assembly (30a, 30b) comprises a set of three rotary members which engage the stoppers (S1, S2, S3) according to generatrices arranged like the vertexes of a triangle, one of which rotary members is a motorized driving wheel (32a, 32b), having an axis inclined with respect to the axis of the stoppers, which drives the stoppers into rotation around their axis (Z) and is rotated in such a direction as to feed the stoppers, while the other two rotary members are idle pressure rollers (36a, 36b) whose axes are parallel to the axis of the stoppers, the three rotary members of each assembly being interconnected by a respective self-centering linkage (38a, 38b);
   - and **in that** means are provided to adjust the two self-centering linkages (38a, 38b) in such a manner that in the trueing station (12) the axis (Z) of each stopper (S1, S2, S3) remains the same before, during and after the trueing.

2. Machine according to claim 1, **characterized in that** the motorized driving wheel (32a, 32b) of each assembly (30a, 30b) is carried by a respective slide (40a, 40b) whose position is adjustable in a direction perpendicular to the axis (Z) of the stoppers (S1, S2, S3), and each self-centering linkage (38a, 38b) comprises a respective pair of rocking levers (42a, 42b) each of which is fulcrumed around a respective fixed axis parallel to the axis (Z) of the stoppers (S1, S2, S3) and one arm of which is connected to the respective slide (40a, 40b), while the other arm of the lever carries the respective pressure roller (36a, 36b).

3. Machine according to claim 2, **characterized in that** the two rocking levers (42a, 42b) of each linkage (38a, 38b) are specularly arranged with respect to a median plane containing the axis (Z) of the stoppers (S1, S2, S3) and passing through the centre of the respective driving wheel (32a, 32b).

4. Machine according to claim 2 or 3, **characterized in that** the slide (40a, 40b) of each assembly (38a, 38b) has a thrust regulator (50a, 50b) associated thereto for the respective driving wheel (32a, 32b),

which comprises a pneumatic actuator (52a, 52b) with a piston rod (54a, 54b) which is connected to the respective slide (40a, 40b) and biases the slide towards the stoppers (S1, S2, S3), and which is fed with compressed air through a pressure regulator (55), and **in that** the rod (54a, 54b) of each slide (40a, 40b) has a respective device associated thereto for the micrometric adjustment of the end position of the respective slide (40a, 40b) according to the diameter of the stoppers on which the trueing is carried out.

5. Machine according to any of the preceding claims, **characterized in that** each driving wheel (32a, 32b) is driven by a respective asynchronous electric motor through an electrical circuit which allows the two motors (34a, 34b) to impart to the stoppers the same speed of rotation both before and after the trueing.

6. Machine according to any of the preceding claims, **characterized in that** the circular blade (16) is fixed to the shaft of a motor (18) carried by a slide (22) which can be micrometrically moved towards the stoppers (S2) which are being trued and in the opposite direction for adjusting the cutting depth of the blade (16).

7. Machine according to any of the preceding claims, **characterized in that** the inclination of the two driving wheels (32a, 32b) is adjustable in order to allow to regulate the feed rate of the stoppers (S1, S2, S3) according to the requirements.

8. Machine according to claim 7, **characterized in that** the inclination of the two driving wheels (32a, 32b) is micrometrically adjustable in unison by a handwheel (76).

9. Machine according to any of the preceding claims, **characterized in that** the circular blade (16) is provided with a peripheral cutting portion of a sintered agglomerate of tungsten, molybdenum or tantalum carbides, with cobalt as a binder, such as Widia®.

10. Machine according to any of the preceding claims, **characterized in that** the feeding conduit (14) and the axis (Z) of the stoppers (S1, S2, S3) are vertical and the feeding of the stoppers in the conduit takes place by gravity.

FIG_1

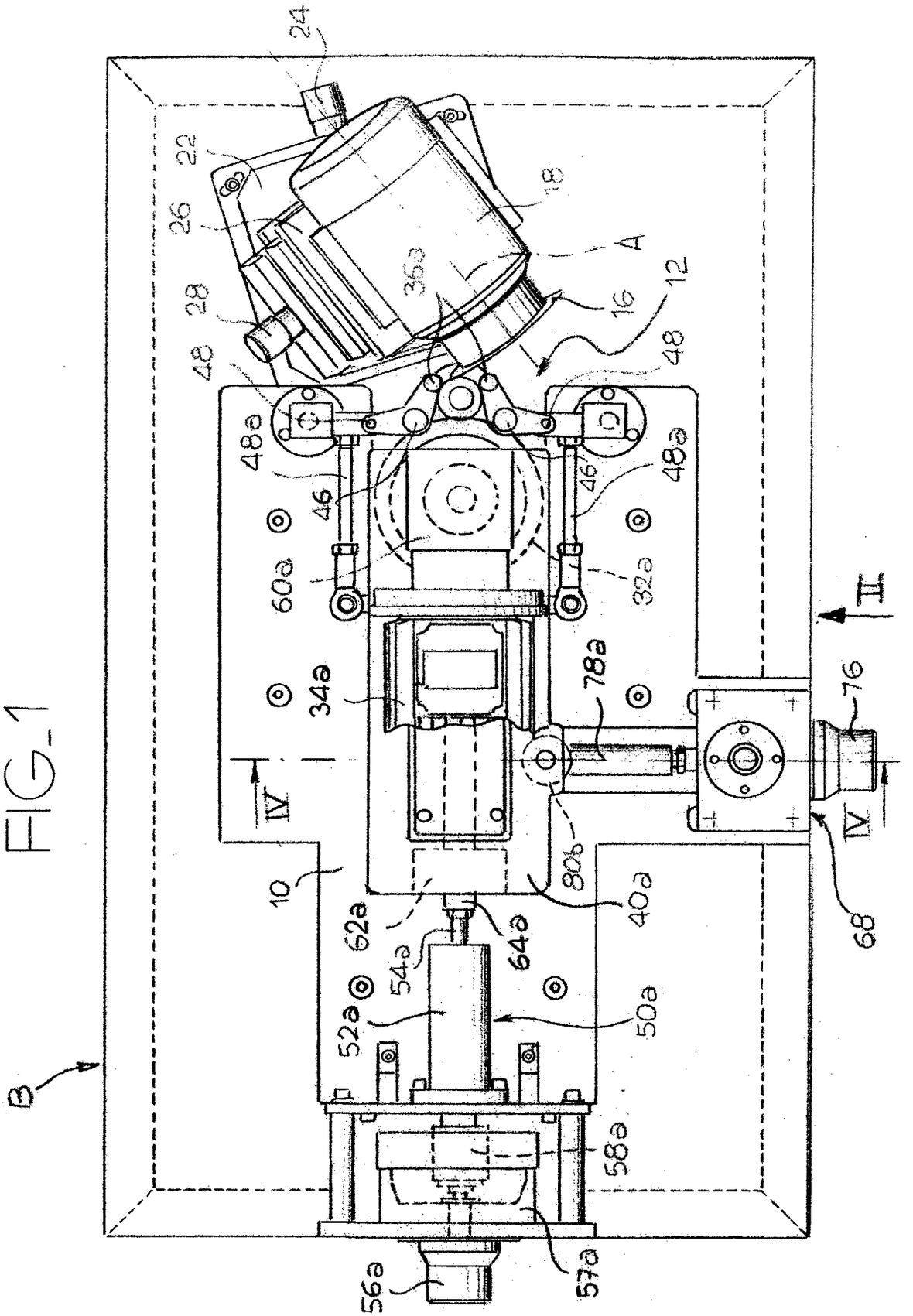

24
22
26
28
48
18
A
36a
16
12
48
48a
46
60a
32a
II
34a
78a
76
IV
V
10
80b
40a
62a
64a
54a
52a
50a
58a
56a
57a
68
B

FIG.2

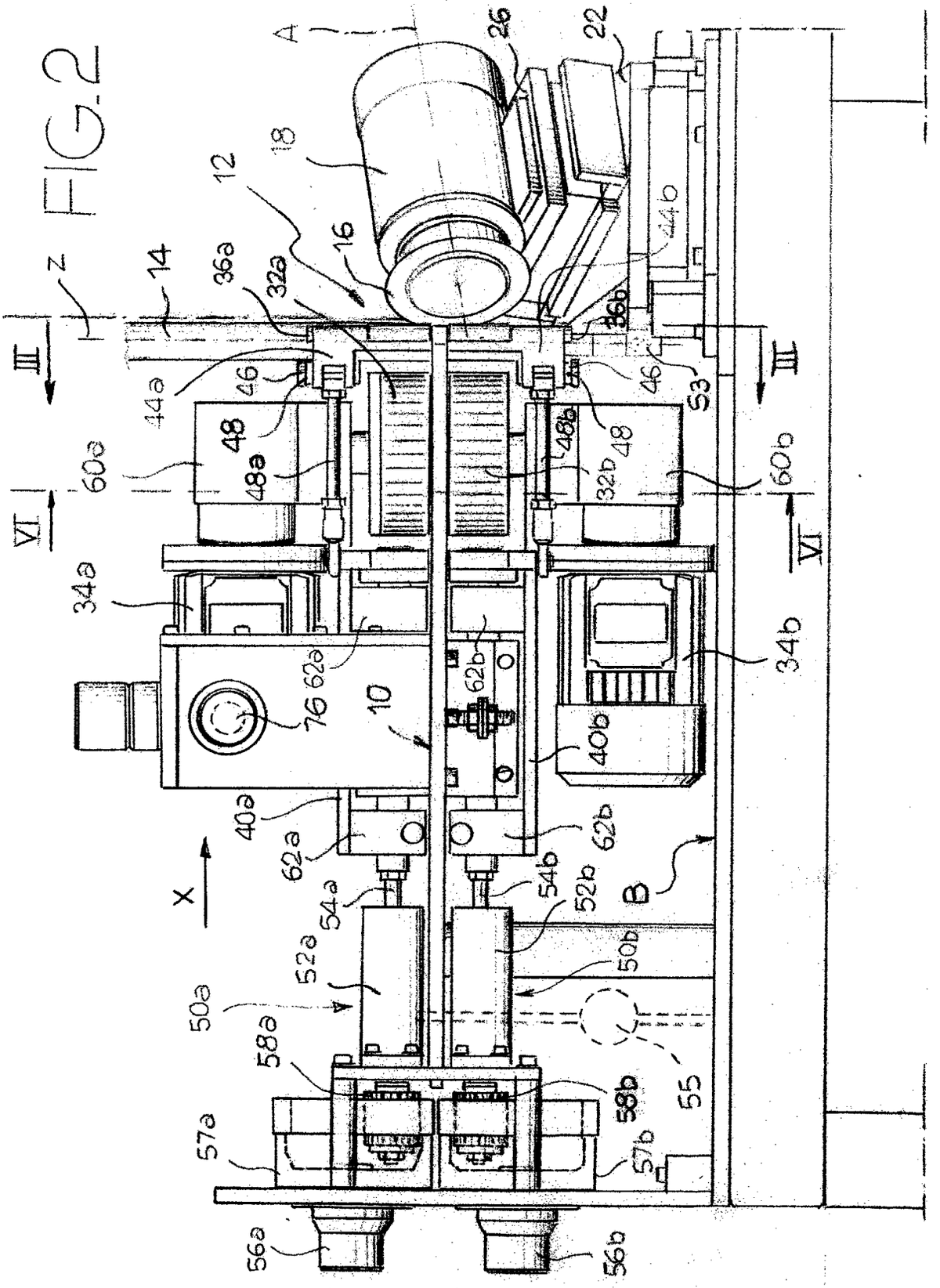
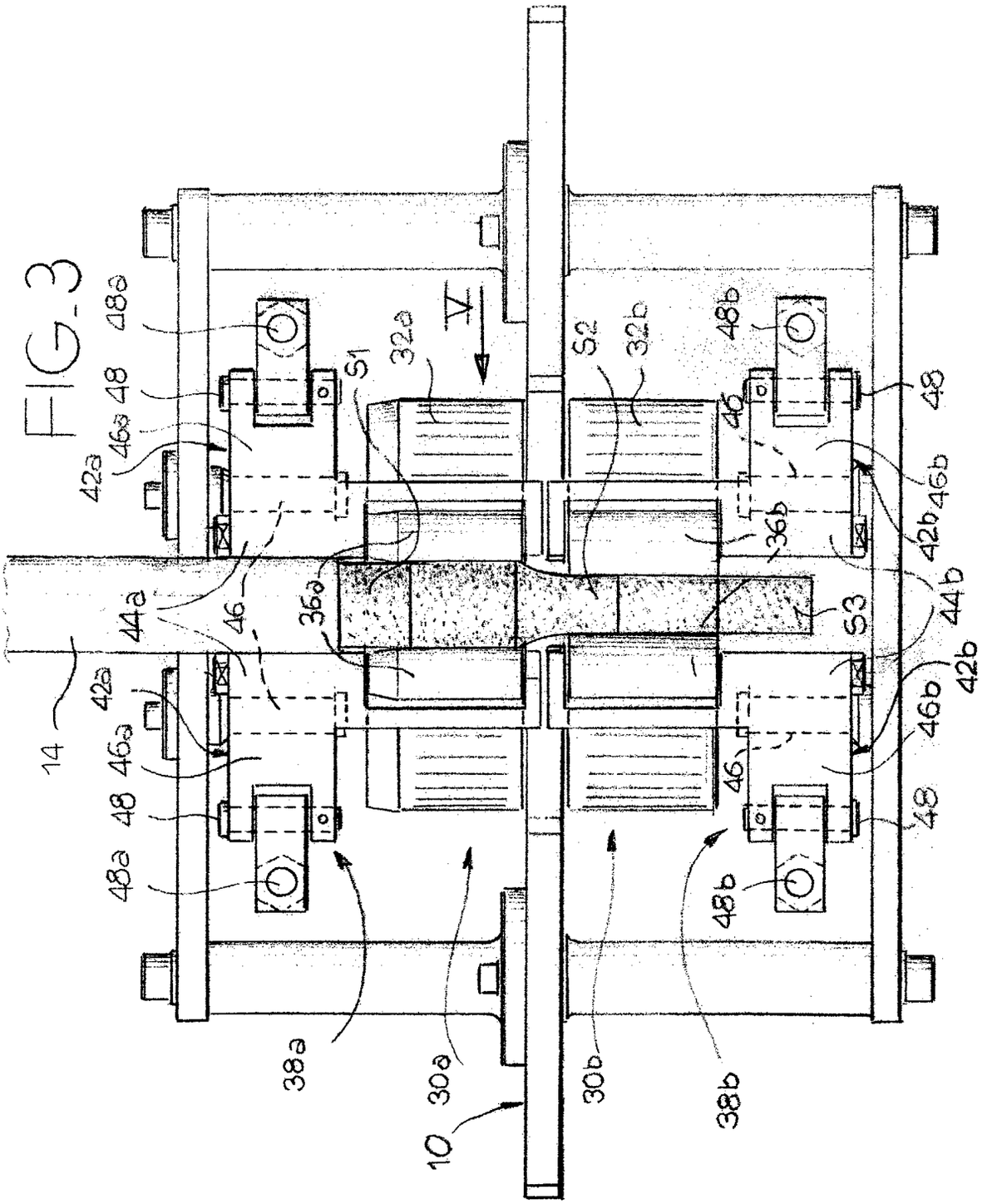

A
26
22
18
12
16
14
36a
32a
44b
36b
Z
III
III
46
44a
48
48a
48b
53
60a
60b
VI
VI
34a
34b
62a
62b
76
10
40b
40a
X
B
54a
54b
52a
52b
50a
50b
58a
58b
55
57a
57b
56a
56b

FIG_3


V
S1
S2
S3
32a
32b
36a
36b
38a
38b
30a
30b
10
14
42a
42b
44a
44b
46
46a
46b
48
48a
48b

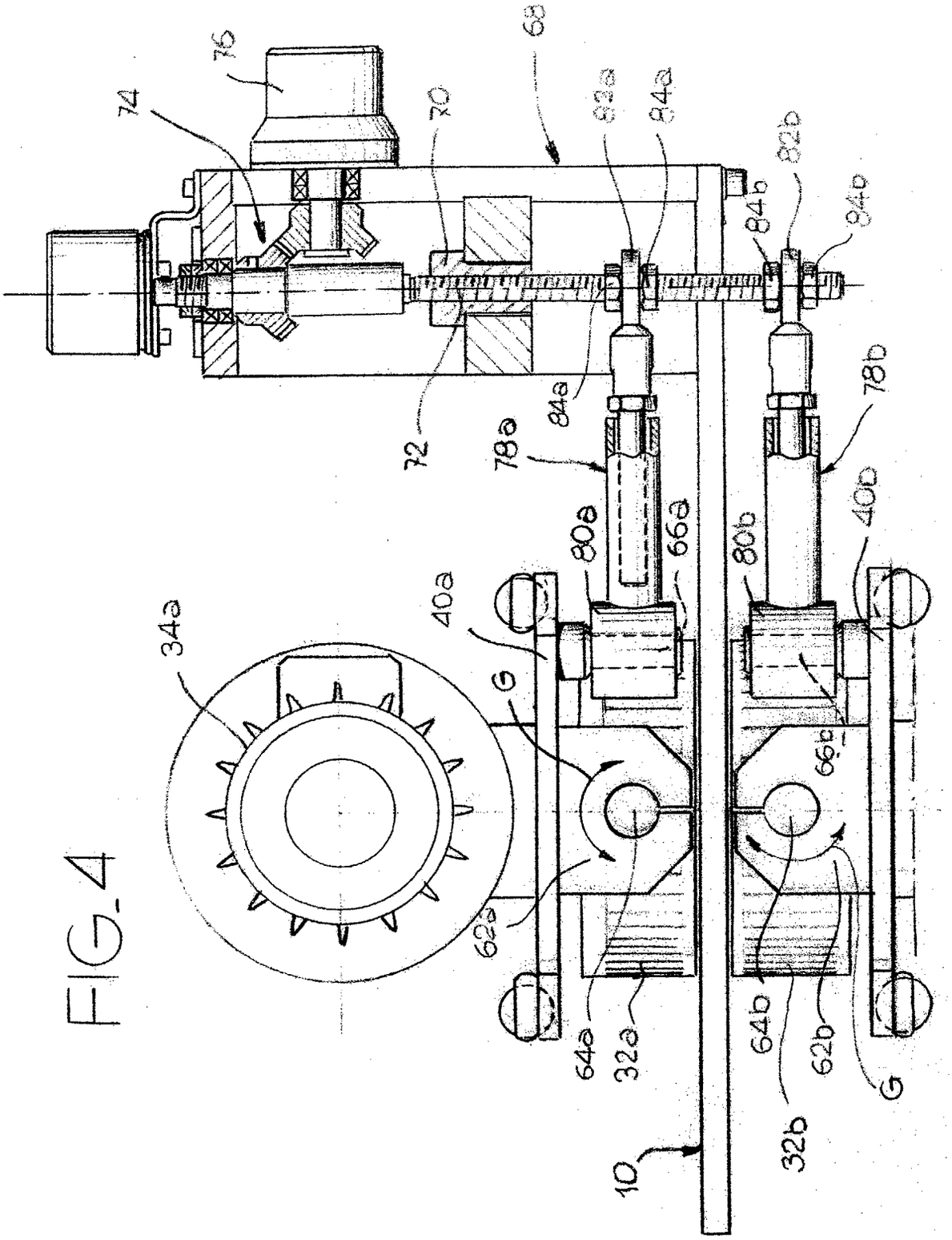

74
76
70
68
82a
84a
82b
84b
94b
72
84a
78a
78b
80a
66a
80b
40b
40a
34a
G
66b
62a
64a
32a
64b
62b
G
32b
10

FIG_4

FIG_5

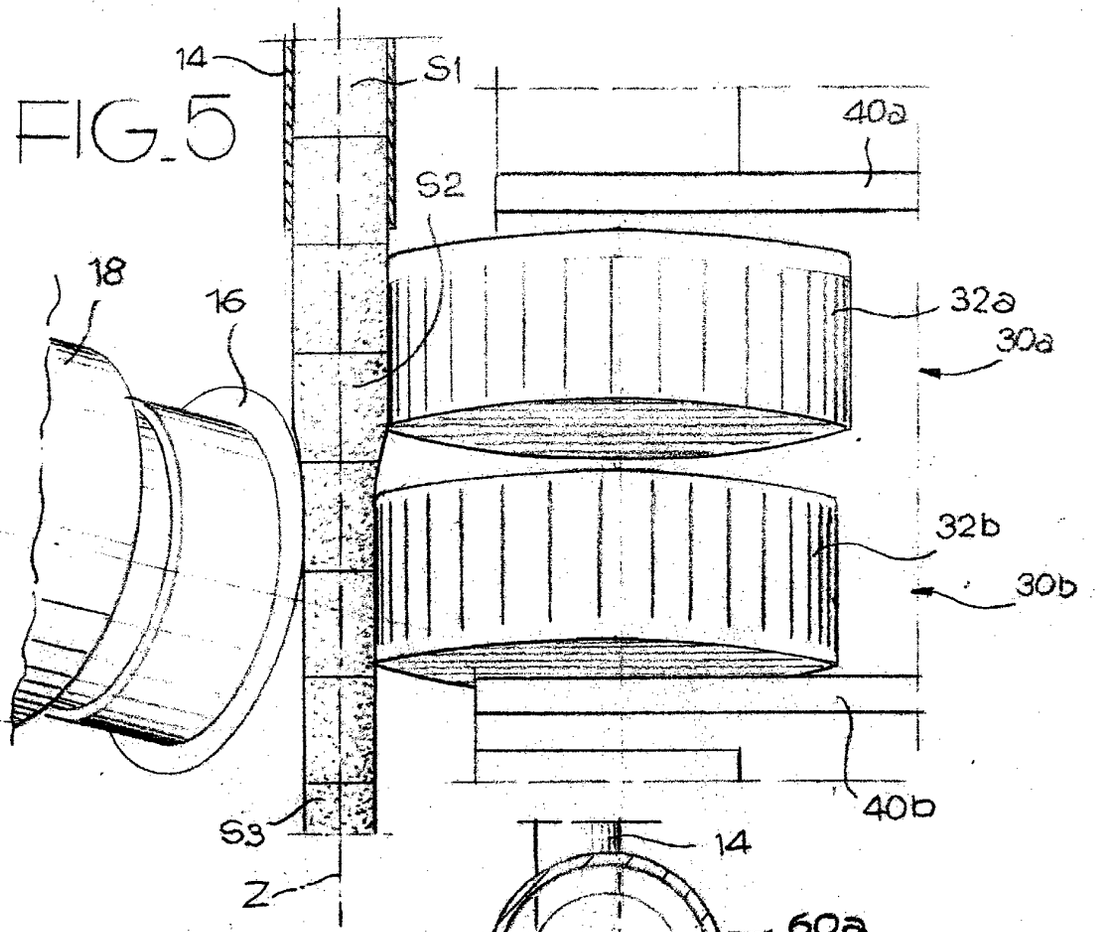
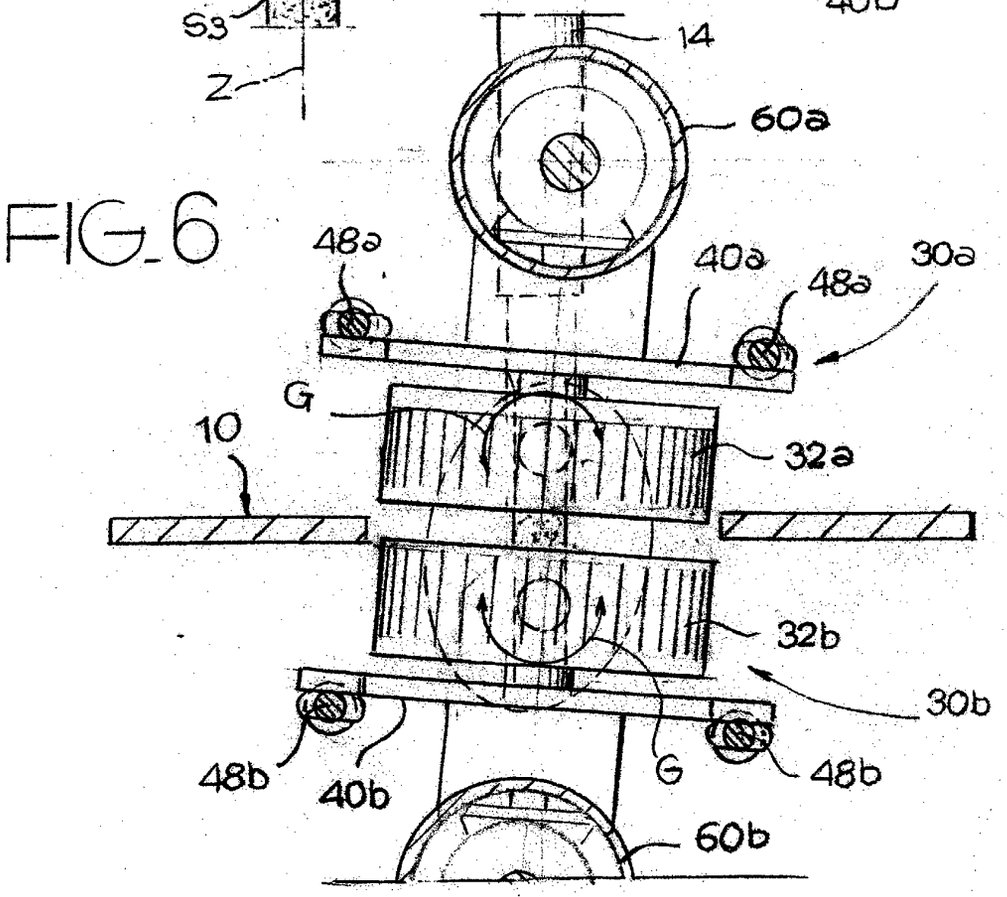

14
S1
40a
S2
18
16
32a
30a
32b
30b
40b
S3
Z

FIG_6


14
60a
48a
40a
48a
30a
G
10
32a
32b
30b
48b
40b
G
48b
60b