



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 035 018 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.09.2000 Bulletin 2000/37

(51) Int. Cl.⁷: **B65B 5/10**, B65B 5/02,
B65B 59/00

(21) Application number: **00105059.0**

(22) Date of filing: **09.03.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **11.03.1999 IT BO990116**

(71) Applicant:
**Studio C.A.D. S.n.c. di Taglioli V. & C.
40057 Granarolo Emilia (Bologna) (IT)**

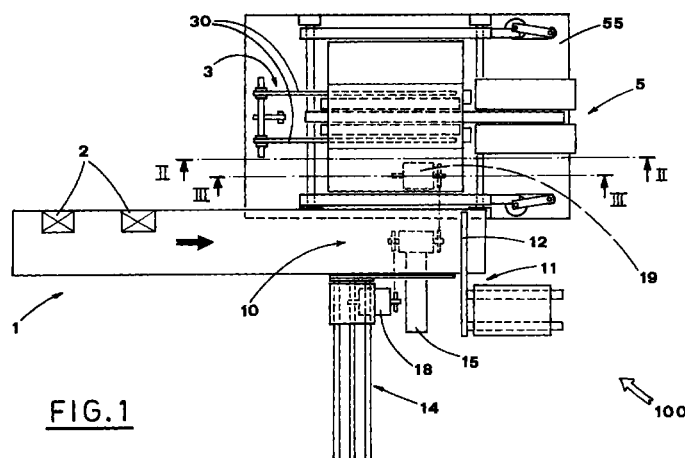
(72) Inventor: **Taglioli, Valerio
40129 Bologna (IT)**

(74) Representative:
**Dall'Olio, Giancarlo
c/o INVENTION s.a.s.,
Via delle Armi, 1
40137 Bologna (IT)**

(54) **Machine for packaging groups of articles into containers obtained from flat folded tubular blanks and for closing filled containers**

(57) The machine (100) includes a first line (1) which feeds articles (2) to a forming station (10), in which groups (20) of articles are formed. A second line (5), arranged beside the first one, includes a working station (50) in which a container (4) is erected, obtained from a flat folded tubular blank (4a). The second working station (50) includes folding means (60) which close first the bottom of the container (4), and after the container (4) has been filled, also the cover thereof. The container (4) is filled by introducing one group of articles (20) at a time, until a first layer is completed. Pushing means (14) aimed at introducing the groups of articles

(20) perform strokes of programmed amplitude corresponding to the position of the group of articles (20) in the respective layer. The second conveying line (5) is carried by a platform (55) having a variable height, which is lowered by an entity corresponding to the articles (2) height each time a layer has been completed. After the cover of the container (4) has been closed, the latter is sent to the outlet of the second working station (50), where taping means (70) operate, so as to close and fix the bottom and cover.



EP 1 035 018 A1

Description

[0001] The present invention relates to packaging machines, particularly to the so-called "end-of-line" machines, i.e. machines which introduce packaged articles in containers, e.g. cardboard boxes.

[0002] Packaging machines are commercially available which are obtained with rather different technical solutions for being used for different purposes. Therefore, it is difficult to describe all the technical-functional aspects of the most important solutions.

[0003] One of the common features of known machines concerns the working system, according to which the container and the group of articles are formed separately; the group of articles is introduced into the related container only after having been completely formed.

[0004] The machines of this kind are quite complicated, big and not easily adaptable to different container or article sizes.

[0005] This inevitably increases the machine production costs, which often causes difficulty in selling them, especially in those cases in which the machine operation speed is relatively low.

[0006] Actually, packaged articles are often introduced manually into containers by an operator at the outlet of a production line.

[0007] The object of the present invention is to propose a machine for packaging articles into related containers, which is simple and cheap to produce, and which is very versatile, so as to be easily adapted to different conditions, meanwhile reducing the time necessary to substitute elements for size change over.

[0008] Another object of the present invention is to propose a machine for packaging articles into related containers, which is small and can be used also in places with limited room.

[0009] A further object of the present invention is to propose a machine, which fills the containers in a way such as an expert operator does manually.

[0010] Still another object of the present invention is to propose a machine, whose structure does not include many electronically controlled electrical activators.

[0011] Yet another object of the present invention is to propose a reliable and functional machine, which avoids jamming of groups of articles during their introduction into the containers.

[0012] Still a further object of the present invention is to propose a universal machine, which can handle rigid, soft and/or delicate articles without changing any of the machine operating means.

[0013] The characteristic features of the proposed machine will be more fully apparent from the following detailed description of a preferred embodiment, in accordance with the contents of claims and taken in conjunction with the accompanying drawings, in which:

- Figure 1 is a schematic plan view of the proposed

machine;

- Figures 2a, 2b are section views taken along II-II in Figure 1, with the elements shown in two different operation steps;
- Figure 3 is a section view taken along III-III in Figure 1;
- Figure 4 is a plan view of the means shown in Figure 3;
- Figures 5a, 5b, 5c are section views taken along V-V in Figure 2b, with the means shown in different operation steps;
- Figures 6a, 6b are section views taken along VI-VI in Figure 5c of means for closing the cardboard container bottom, in two operation steps;
- Figure 7 is a schematic plan view, similar to Figure 1, of the proposed machine in a operation step corresponding to Figure 5c;
- Figures 8a, 8b, 8c, 8d, 8e, 8f, 8g are section views, similar to Figure 5c, of the progressive operation steps of the container filling and closing;
- Figure 9 is a plan view, like Figure 1, of the proposed machine during taping of the filled and closed container.

[0014] With reference to the above mentioned figures, the reference numeral 100 indicates the proposed machine.

[0015] The machine 100 includes a first conveying line 1 for orderly conveying the articles 2 coming from a related packaging machine, not shown, and brought to a first working station 10, situated in the final area of the first conveying line 1.

[0016] The first working station 10 is aimed at forming groups 20, each of which is composed of a predetermined number of the articles 2, arranged in a row and leaning one against another.

[0017] For this purpose, the first working station 10 includes stop means 11, formed by a bar 12, which is disposed crosswise to the first conveying line 1 and against which the first article 2 of each group 20 being formed stops.

[0018] The position of the bar 12 is adjustable in relation to the size, as will be better explained later.

[0019] The first working station 10 includes also pushing means 14, acting in crosswise direction with respect to the first conveying line 1, so as to push the completed groups 20.

[0020] The pushing means 14 are operated, in a way described later, by a programmable motor means 15 (e.g. a brushless motor), through known, not shown, drive-transmission means.

[0021] The machine 100 includes a magazine 40 for storing a pile of flat folded tubular blanks 4a (Figure 2a).

[0022] The magazine 40 is situated over a second conveying line 5, arranged beside the first line 1 and parallel thereto.

[0023] Withdrawing means, situated between the

magazine 40 and the second conveying line 5, include e.g. a pair of parallel arms 30, hinged together along a common rotation axis 31 and equipped with suction means of known type and not shown (Figures 2a, 2b).

[0024] The arms 30 oscillate, driven by power means 32, between two extreme positions, indicated with broken and continuous line in Figure 2a. In one position the lowermost flat folded tubular blank 4a of the pile in the magazine 40 is withdrawn, while in the other position, the blank just withdrawn and arranged horizontally, is placed in a second working station 50 joined to the second conveying line 5.

[0025] The second working station 50 is transversely aligned with the station 10, in which the groups are formed, and is equipped with blank erecting means 51, which act on the flat folded tubular blank 4a, brought to the second working station 50 by the withdrawing means 3, so as to erect it into a respective container 4 (Figures 2a and 2b).

[0026] The erecting means 51 include one contrast element 52, moved vertically by a jack 53 between two extreme positions, a lowered position (Figure 2a) and a raised position (Figure 2b).

[0027] When in the lowered position, the contrast element 52 is situated below the second conveying line 5, so as to push, during raising, the wall 4b of the flat folded blank 4a, which is aligned with the wall leaning against the second conveying line 5.

[0028] Thus, the wall 4b rotated and raised to the vertical position, erecting the container 4.

[0029] It is to be pointed out how the erecting means 51 cooperate with the withdrawing means 3, which keep the corresponding wall of the container 4 adhering to the second conveying line 5 during the erection of the container.

[0030] A sliding surface 16 is situated in the group forming working station 10, directly below the working arm of the first conveying line 1, and is moved crosswise to the first conveying line by power means 17.

[0031] When in its maximum extracted position, the sliding surface 16 is introduced into the container 4, dwelling in the second working station 50, for a predetermined depth, such that the distance between the end of the surface 16 and the bottom of the container 4 is smaller than the corresponding article 2 dimension.

[0032] The second working station 50 includes also folding means 60, formed by two moving elements 60a, 60b, each of which includes a rectangular frame 61, which features an actuator 66 at each side.

[0033] The frames 61 are arranged vertically, facing each other, symmetrically to a longitudinal middle plane of the second conveying line 5, with respective actuators 66 situated inside the same frames 61.

[0034] The actuators 66 act on a plane parallel to the plane in which the related frame lies, according to respective directions converging toward the center of the frame (Figures 6a, 6b).

[0035] The dimensions of the frames 61 are such

as to define thereinside, when the actuators 66 are in rest position, a free space, which allows a container 4 to pass therethrough.

[0036] The frames 61 are slidably supported by a pair of stems 62 situated below the second conveying line 5, crosswise thereto.

[0037] The frames 61 move close to or away from each other, controlled by a rod 64, which is parallel to the stems 62. The rod 64 has two portions threaded in opposite directions, located on opposite sides thereof and engaging with nut screws 65 connected to the frames 61 (Figures 5a, 5b).

[0038] A toothed wheel 67, keyed to the central portion of the rod 64, is pulled by a motor 68 in a requested direction (Figures 5a, 5b).

[0039] The second conveying line 5, the withdrawing means 3, the erecting means 51 and the folding means 61 are carried by a platform 55, whose height can be changed.

[0040] The means for changing the platform 55 height include e.g. four threaded columns 54, carried by a stationary structure of the machine 100, with possibility to turn about a vertical axis.

[0041] The threaded columns 54 engage with relative nut screws 55 (Figures 3 and 4).

[0042] Crowns 54a, keyed to the base of the columns 54, are operated synchronously by a chain 58 pulled by a sprocket wheel 59.

[0043] The sprocket wheel 59 is driven by a programmable motor (e.g. brushless motor) in a way described later.

[0044] According to the described embodiment of the machine 100, the sprocket wheel 59 is driven by the same motor 15, which drives also the pushing means 14.

[0045] The motor 15 cooperates with a pair of known brake-clutch devices 18, 19 situated between the motor 15 output shaft and respective transmission means, which operate the pushing means 14 and the platform 55.

[0046] Thus, by operating the devices 18, 19, the motor 15 can drive alternately the pushing means 14 or the platform 55, which is compatible with the working steps.

[0047] Tape applying means 70, of substantially known type, are situated downstream of the second working station 50 for applying adhesive tape to close the bottom and the cover of the container 4 going out of the second working station 50.

[0048] The tape applying means 70 include two tape stretching groups 70a, 70b, advantageously connected with the above mentioned moving elements 60a, 60b of the folding means 60.

[0049] According to known technique, the machine 100 is equipped with all control and detection means, which allow to verify the correct operation thereof in real time and to stop it in case of a jam; for sake of clarity, the above mentioned means have been neither shown nor

described, since not strictly relevant to the object of the present invention.

[0050] Now, the operation of the machine 100 will be described, beginning from the moment, in which the first group 20 of articles is being formed in the first working station 10, and the container 4 is erected in the second working station 50.

[0051] In order to put the group 20 in a correct position, it is necessary to adjust the bar 12, so that is located practically flush with the wall 4b of the container 4, crosswise to the second conveying line 5 and facing the outlet thereof.

[0052] After that the container 4 has been erected, the rod 64 is rotated by the motor 68, so as to move the moving elements 60a, 60b symmetrically close to each other, from their rest position, in which they are clear of the container 4 (Figure 5a) to the working position (Figure 5b), in which the actuators 66 have their reciprocally facing sides aligned with the corresponding folding lines 4c, on which the vertical flaps 4d and horizontal flaps 4f, aimed at forming the bottom and the cover of the container 4, respectively, are hinged on both sides of the central body of the container 4.

[0053] At this point, the actuators 66 of the moving element 60a are operated in phase relation, so as to close the container 4 bottom; more precisely, the actuators for closing the vertical flaps 4d are operated first (Figure 6a) and then the actuators for closing the horizontal flaps 4a are operated, after the first actuators have returned to their rest position (Figure 6b).

[0054] The actuators 66, acting on the horizontal flaps 4f, remain in their working position until the container 4 leaves the second working station 50.

[0055] The just described working cycle step is shown in Figures 5c and 7; in this configuration, the sliding surface 16 is already in its maximum extracted position, situated inside the container 4.

[0056] Afterwards, the pushing means 14 are operated to perform their first stroke, during which they push the side of the just completed first group of articles 20, and, cooperating with the sliding surface 16, transfer it inside the container 4, close to the bottom thereof.

[0057] Then, the pushing means 14 return to their initial position and wait for the next group of articles 20 to be formed.

[0058] In the illustrated example, three groups of articles 20 are needed to complete each layer of articles 2 inside the container.

[0059] Therefore, the programmable motor means 15 must operate the pushing means 14 to perform three strokes, the first of which being the one just described, and the other two having the amplitude decreased each time by the depth of the group 20 (Figure 8b).

[0060] Obviously, the number of the strokes necessary to complete each layer and the stroke decrease depend on the articles 2 and container 4 sizes.

[0061] Before the pushing means 14 return to their initial position, after having introduced the last group 20

of the first layer, the sliding surface 16 is withdrawn from the container: this allows to place the first layer of groups 20 on the bottom wall of the container 4, preventing them from leaving the container 4 (Figure 8c).

[0062] After that also the pushing means 14 have returned to their initial position, the formation of the first group 20 of the second layer begins (Figure 8d).

[0063] The programmable motor means 15 connects, by the above mentioned devices brake-friction 18, 19, with the means adjusting the platform 55 level, so as to lower it by an entity corresponding to the articles 2 height.

[0064] Consequently, all the means carried by the platform 55 are lowered, as well as the container 4, thus allowing the sliding surface 16 to be introduced again thereinto over the first layer of groups 20 (figure 8e).

[0065] The just described procedure is repeated until the last group 20 of articles of the last layer is introduced thus completing the container 4 filling.

[0066] While the platform 55 is being raised again, the actuators 66 of the corresponding moving element 60b close the cover of the filled container 4 (Figure 8g).

[0067] After this operation has been completed, the actuators 66 acting on the horizontal flaps 4f forming the cover, as well as the ones acting on the bottom flaps, are kept in their working position.

[0068] At this point, the second conveying line 5 is operated, so as to bring the container 4 out of the second working station 50.

[0069] The actuators 66, kept in their working position, keep the container bottom and cover closed until the tape applying means 70 are operated (Figure 9)

[0070] The movement of the container 4 toward the outlet of the second conveying line 5 allows to finish the taping operation, thus completing the machine 100 working cycle.

[0071] It is extremely evident that the proposed machine, realized in this way, obtains all the previously mentioned objects, in particular it allows to reduce costs and dimensions.

[0072] It is to be pointed out that the considerable costs reduction is possible due to the use of only one motor 15 for operating the pushing means 14 and the platform 55; actually, this kind of motor is rather expensive.

[0073] The working cycle of the proposed machine has been conceived like a working cycle of an operator who manually fills containers: this allowed to obtain simple movements thus reducing the total number of the machine components and the number of size matching elements.

[0074] The limited working speed of the machine 100 ensures the extreme reliability thereof and minimizes jamming risk and, from the other side, it satisfies normal needs of a production line of articles 2.

[0075] Actually, the number of containers 4 to be packaged in a time unit results from the relation between the number of articles 2 produced in the same

time unit and the number of the articles 2, which can be housed in the container 4, thus it is evident that the machine capabilities are considerable.

[0076] Another advantage of the proposed machine concerning its reliability, results from the sliding surface 16 construction, which allows it to enter almost completely into the container 4: during the introduction of the groups of articles into the container 4, this prevents the groups 20 from jamming with other groups of articles of the layer situated below, which could slightly protrude with respect to the others.

[0077] It is to be noted that the machine 100 working way allows to handle not only rigid and regular form articles 2, but also soft and/or delicate, which is not possible with the known machines conceived for less diversified use.

[0078] It is understood that what above has been described as a pure, not limitative example, therefore possible modifications of some details remain within the protective scope of the present technical solution, as described above and claimed hereinafter.

Claims

1. Machine for packaging groups of articles into articles obtained from flat folded tubular blanks, said machine (100) characterized in that it includes:

a first line (1) for orderly feeding articles (2) to a first station (10), in which groups (20) are formed, each of said groups being composed of a predetermined number of said articles (2), arranged in a row and leaning one against another;

stop means (11), which are situated in said groups forming station (10), and against which the first article (2) of said row stops;

a magazine (40) for storing a pile of flat folded tubular blanks (4a) situated over a second line (5) for conveying said containers (4), said second line (5) being arranged beside said first line (1) parallel thereto and carried by a platform (55) having a variable height;

withdrawing means (3), aimed at withdrawing the lowermost flat folded blank (4a) of the pile contained in said magazine (40) and at placing the withdrawn blank, arranged horizontally, on said second conveying line (5) in a second working station (50), said second working station (50) being transversely aligned with said first working station (10), in which the groups (20) are formed;

erecting means (51), situated in said second working station (50) and aimed at acting on the flat folded tubular blank (4a) present in the second working station (50), so as to erect a respective container (4);

folding means (60) situated symmetrically with

respect to the longitudinal middle plan of said second conveying line (5), in the region of said second working station (50) and aimed at acting on the flaps (4d,4f) of the container (4) stopped in said second working station (50), so as to close the container bottom and cover, respectively;

a horizontal sliding surface (16), situated in the said first station (10), in which the groups of articles are formed, directly below the working arm of said first conveying line (1), said sliding surface (16) being moved crosswise to said first conveying line, and aimed at being introduced, for a predetermined depth, into said container (4) stopped in said second working station (50);

pushing means (14), acting crosswise to said first conveying line (1), so as to transfer, cooperating with said sliding surface (16), said group of articles (20) from said groups forming station (10) to the container (4) stopped in said second working station (50);

programmable motor means (15), which drives said pushing means (14) to perform strokes of predetermined and variable amplitude, according to a fixed sequence, from a maximum to a minimum value, for introducing respectively the first and the last group of articles (20) of the same layer of groups inside one container (4);

programmable motor means, aimed at moving vertically said platform (55) and, consequently, the container (4) situated on said second conveying line (5), from a maximum height to a minimum height, according to a predetermined interval sequence, so as to introduce the groups of articles (20) forming respectively the first and the last layers inside the same container (4);

tape applying means (70), situated downstream of said working station (50) and aimed at applying corresponding strips of adhesive tape, so as to close and fix said bottom and cover of the container (4) leaving said second working station (50)

2. Machine according to claim 1, characterised in that said stop means (11) include a bar (12), situated crosswise to said first conveying line (1) and aimed at being located in alignment with the wall (4b), which is crosswise to said second conveying line (5) and facing the outlet thereof, of said container (4) stopped in said second working station (50).

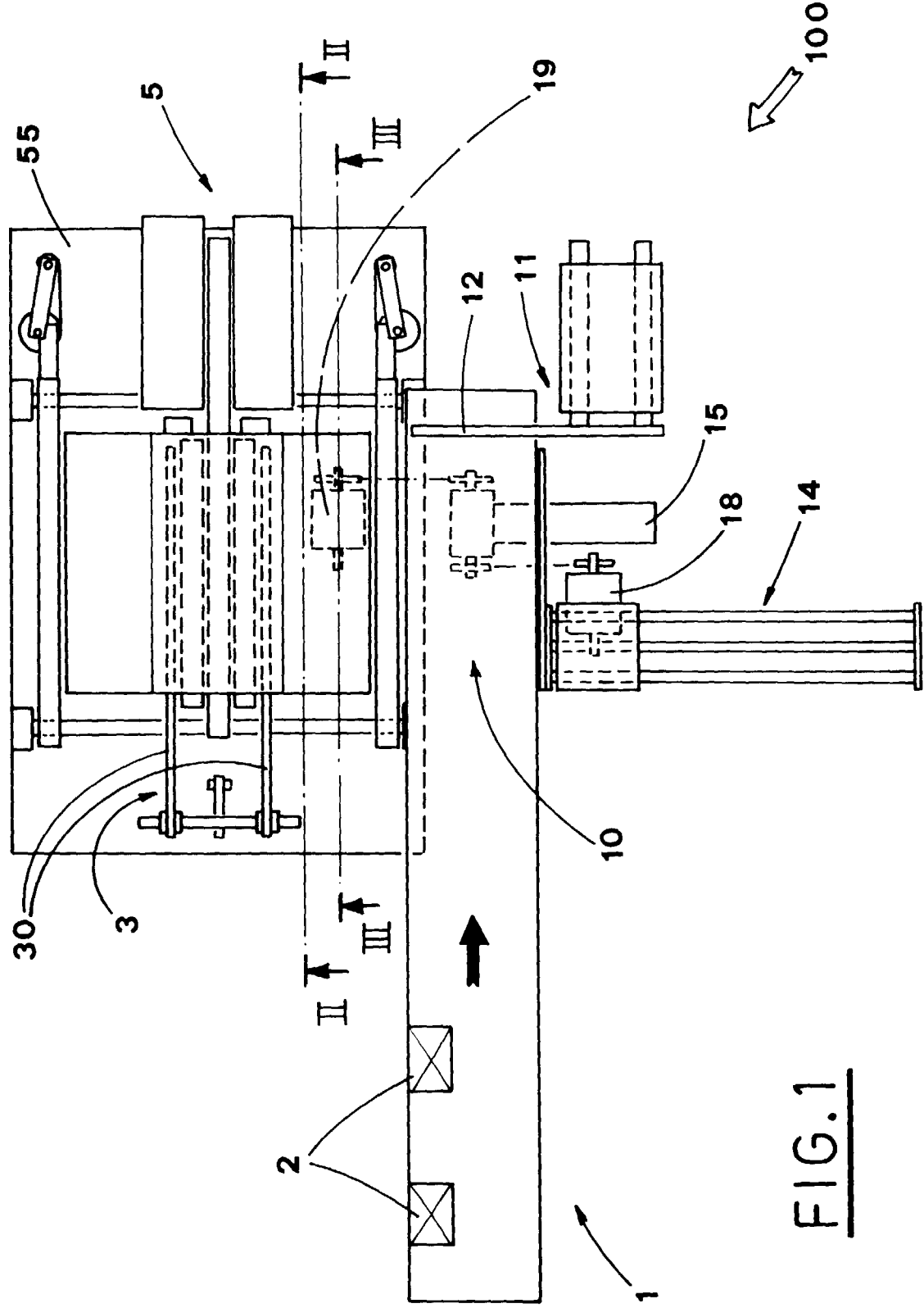
3. Machine according to claim 1, characterised in that said withdrawing means (3) include a pair of parallel arms, hinged together along a common rotation axis (31) and equipped with suction means, said arms (30) being driven, by power means (32), so that they oscillate between two extreme positions,

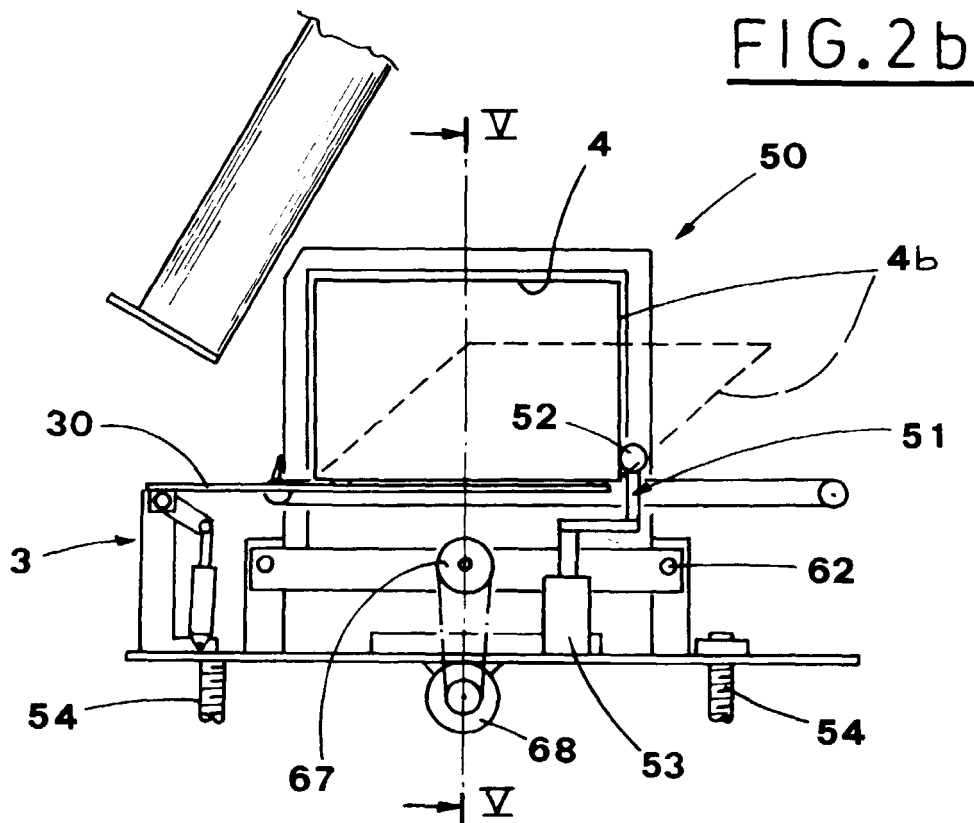
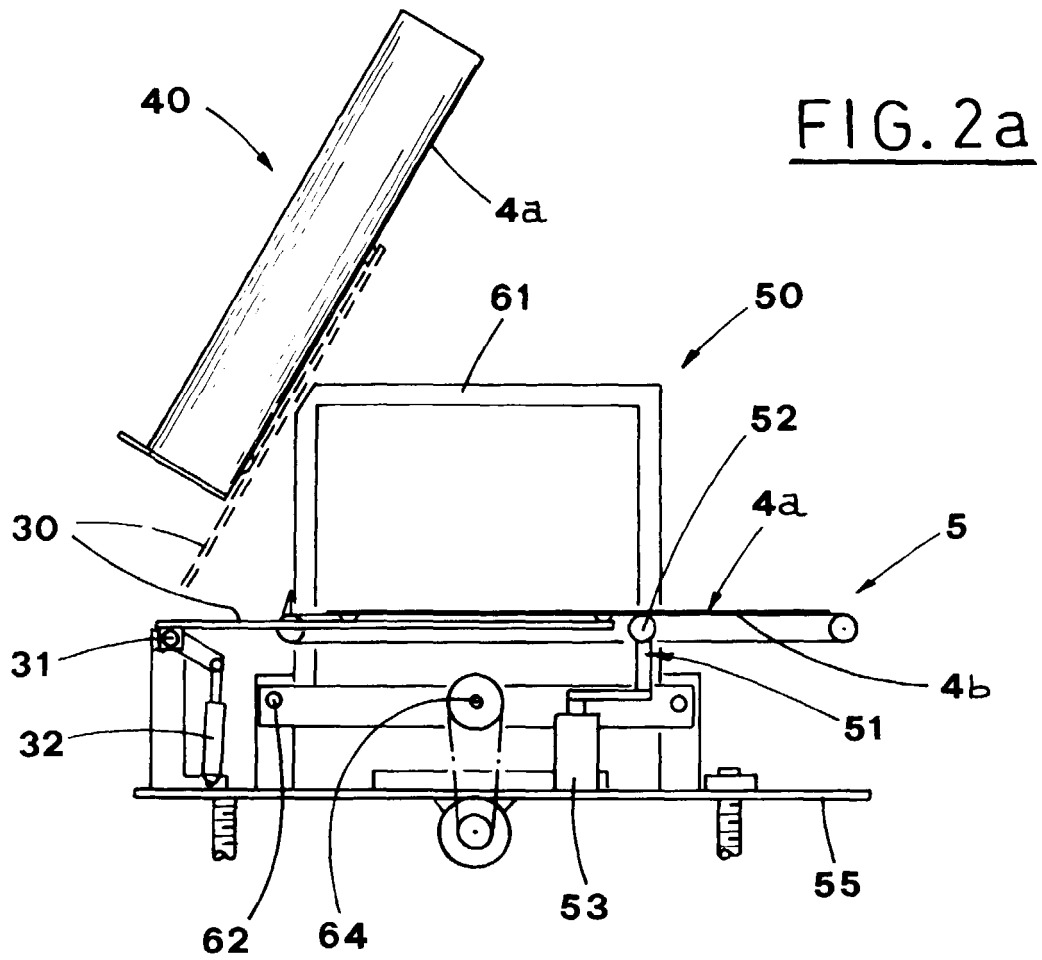
corresponding to the withdrawing of the blank (4a) and to the placing thereof, respectively.

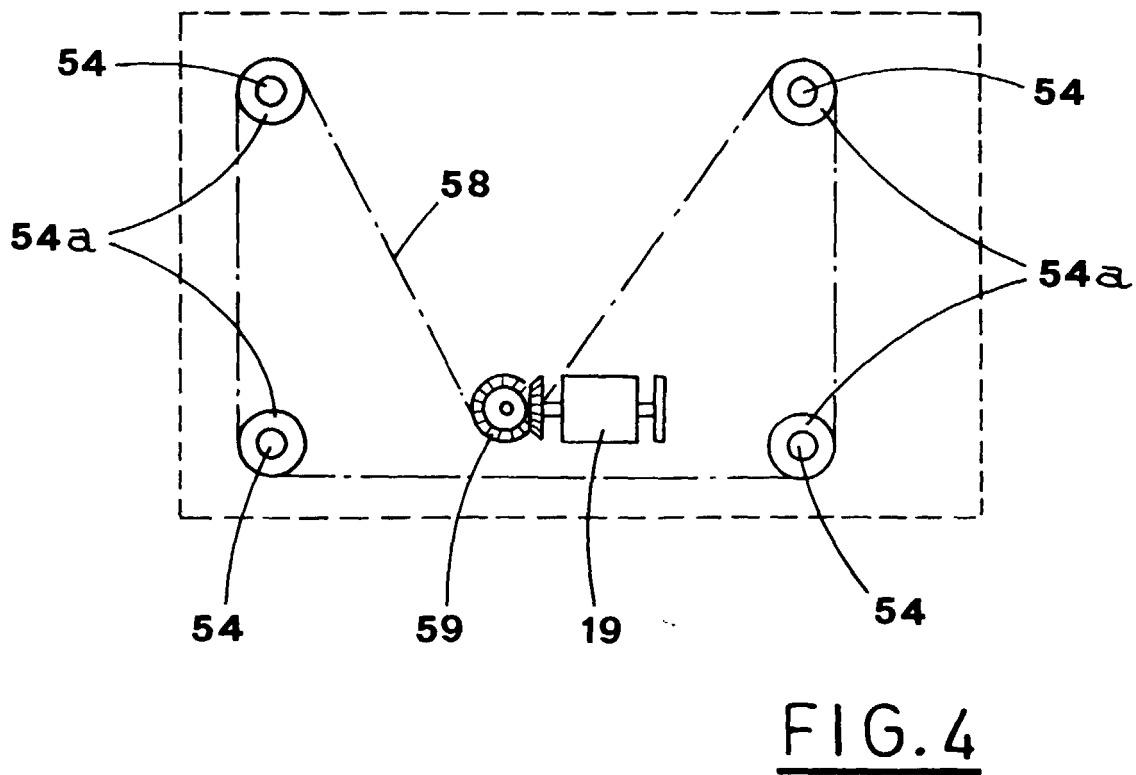
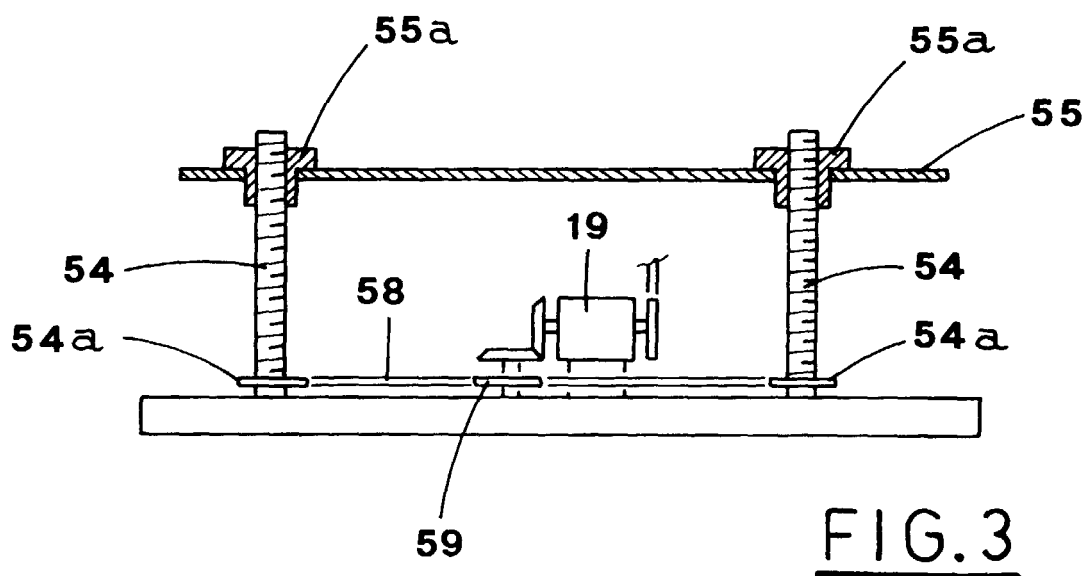
4. Machine according to claim 1, characterised in that said erecting means (51) include at least one contrast element (52), driven by a jack (53) to move vertically between two extreme positions, lowered position and raised position, with said contrast element (52) being aimed at pushing, during raising, the wall (4b) of the flat folded blank (4a), which is aligned with the wall leaning against said second conveying line (5), thus, said wall (4b) being raised from the horizontal to the vertical position for erecting the container (4). 5 10
5. Machine according to claim 1, characterised in that said folding means (60) include two moving elements (60a,60b), each of which includes a rectangular frame (61), which features, in each of its sides, an actuator (66), with said frames (61) arranged vertically and facing each other, the dimensions of said frames (61) being such as to define therein, when the actuators (66) are in rest position, a free space, which receives a container (4), with said moving elements (60a,60b) slidably supported by a pair of stems (62) situated below the second conveying line 5, crosswise thereto, with said moving elements (60a,60b) being connected to means which control their synchronous movement close to or away from each other, from a rest position, outside the container (4), to a working position, in which said actuators (66) push the respective flaps (4d,4f) as well as fold them around the folding lines (4c), along which said flaps (4d,4f) are hinged to the central body of said container (4). 15 20 25 30 35
6. Machine according to claim 5, characterised in that said actuators (66) are fastened to the respective frames (61) on the side facing said second conveying line (5) and are aimed at acting linearly on corresponding planes parallel to the frames planes, according to respective directions, converging toward the center of the frames (61). 40 45
7. Machine according to claim 5, characterised in that said means controlling said moving elements (60a,60b) include a rod (64), which is parallel to said stems (62) and having two portions threaded in opposite directions and located on opposite sides thereof for engaging with nut screws (65) connected to said frames (61), with said rod (64) having, keyed to the central portion thereof, a toothed wheel (67), which is rotated by motor means (68). 50 55
8. Machine according to claim 1, characterised in that said platform (55) supports, beside said second conveying line (5), also said withdrawing means (3),

erecting means (51) and folding means (60) and in that said platform (55) is moved vertically by two threaded columns (54) carried by a stationary structure of the machine 100, with possibility to turn about a vertical axis, and engaged with relative nut screws (55a) fastened to said platform (55), with said threaded columns (54) being rotated synchronously by transmission means (54a,58,59) operated by said programmable motor.

9. Machine according to claim 1, characterised in that it includes only one programmable motor means (15) aimed at operating alternately said pushing means (14) and said platform (55), by a pair of brake-clutch devices (18,19) arranged parallel at the motor (15) output shaft upstream of said pushing means (14) and said platform (55).







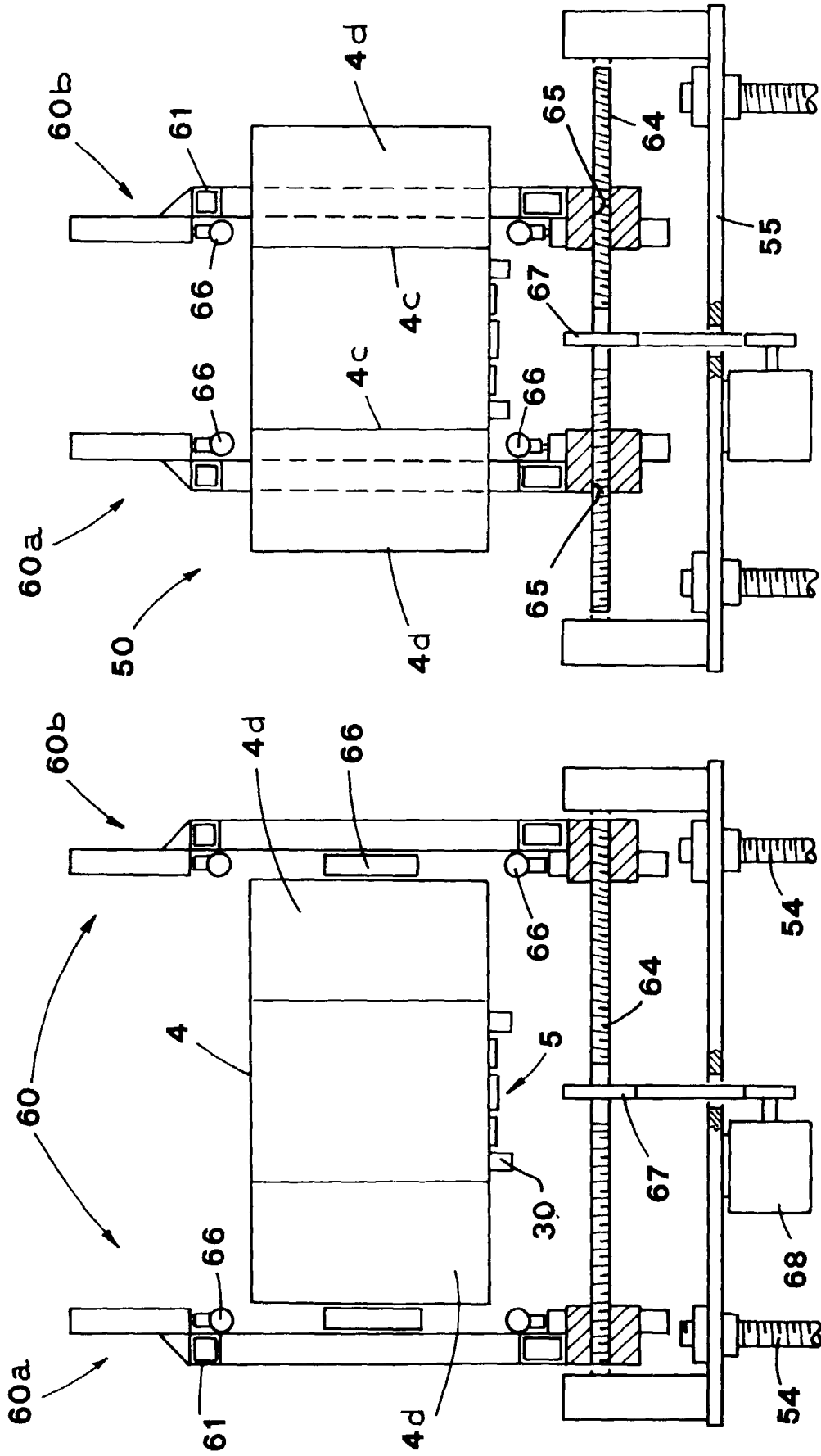


FIG. 5b

FIG. 5a

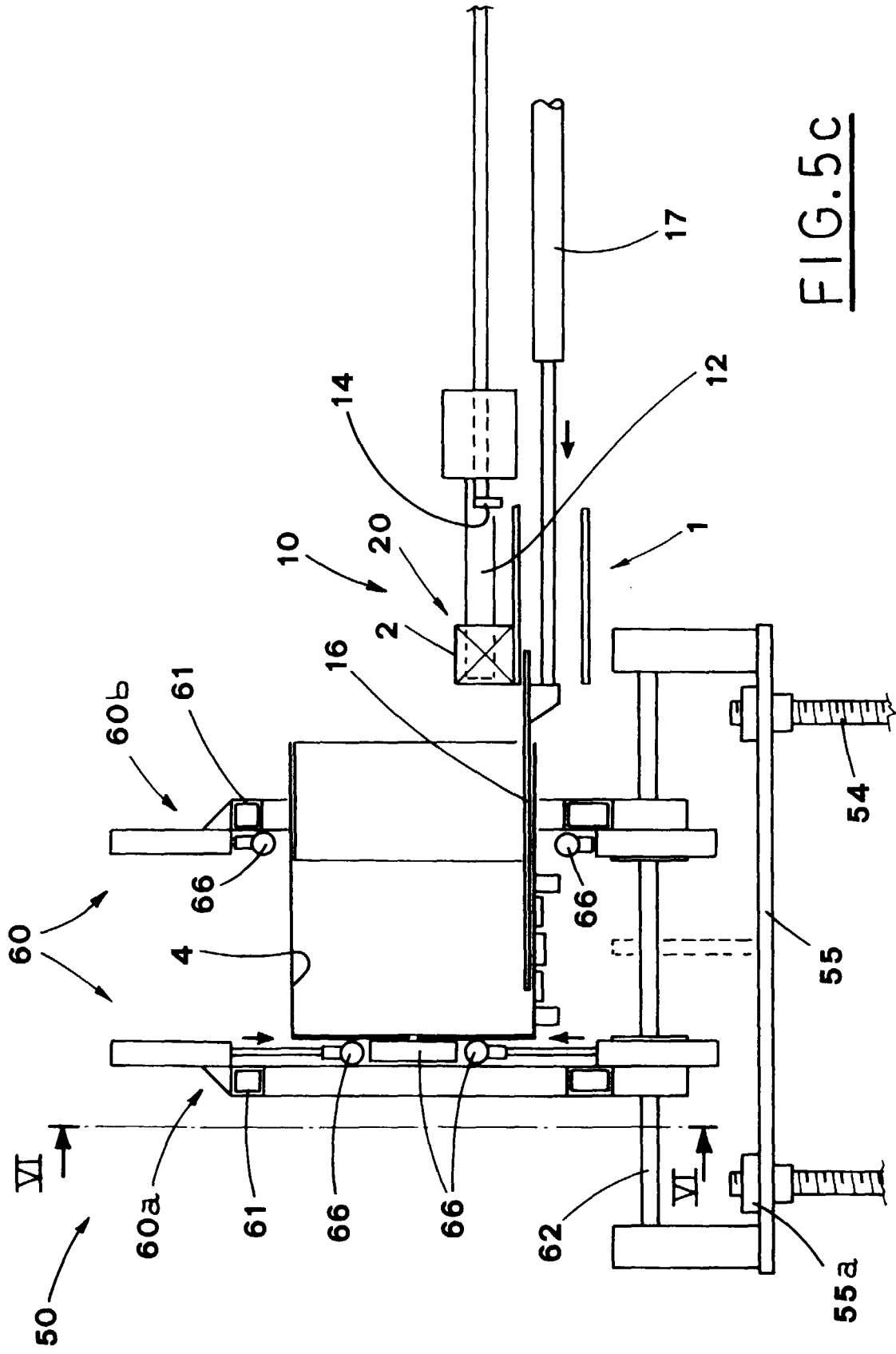


FIG. 6a

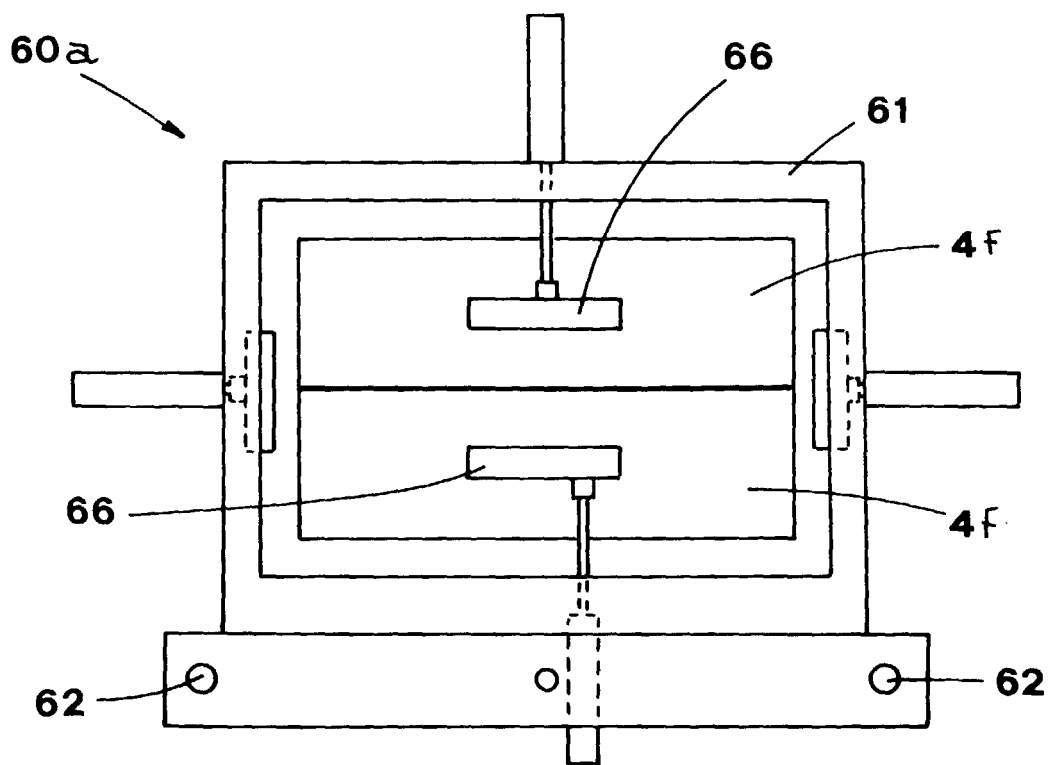
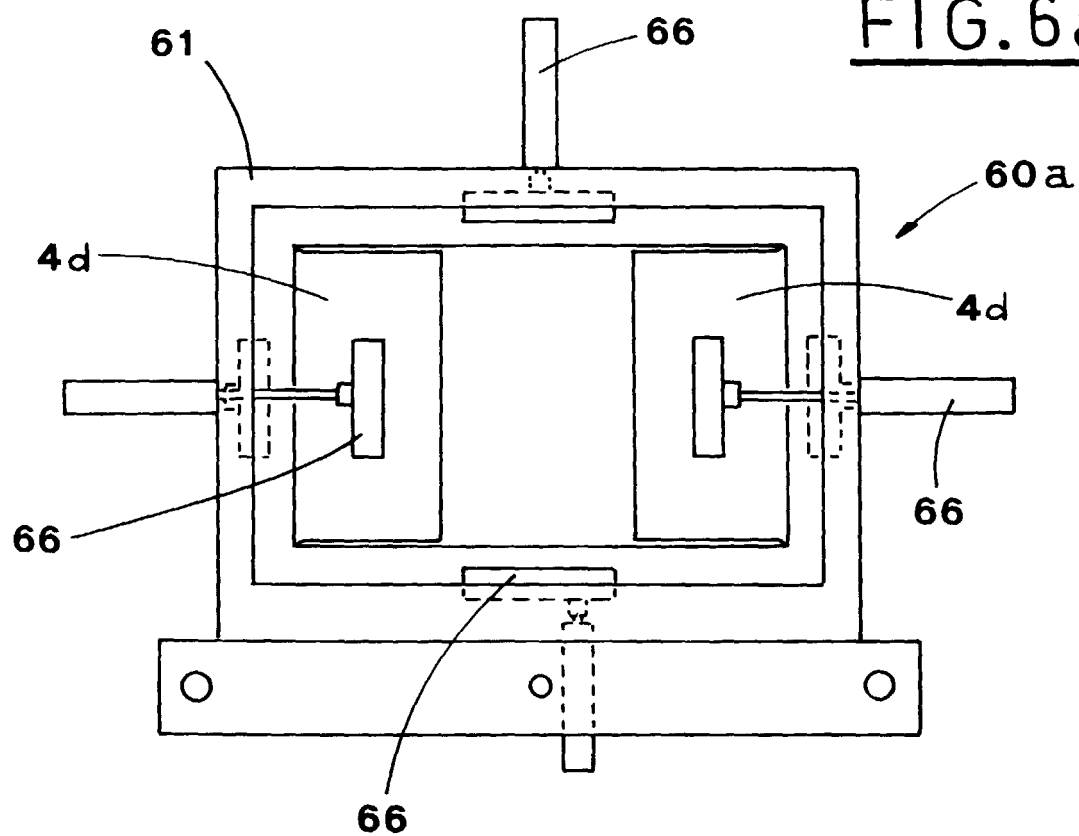


FIG. 6b

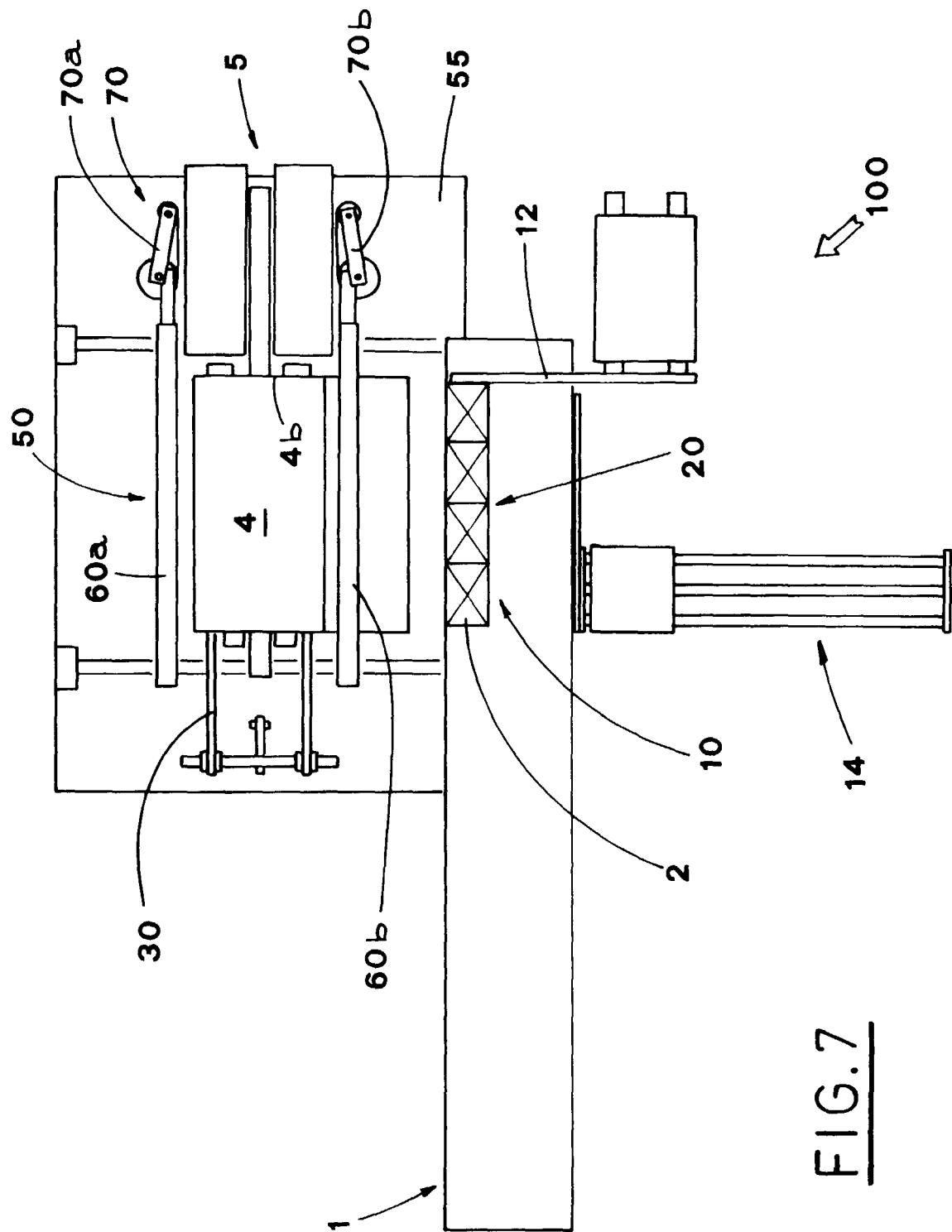
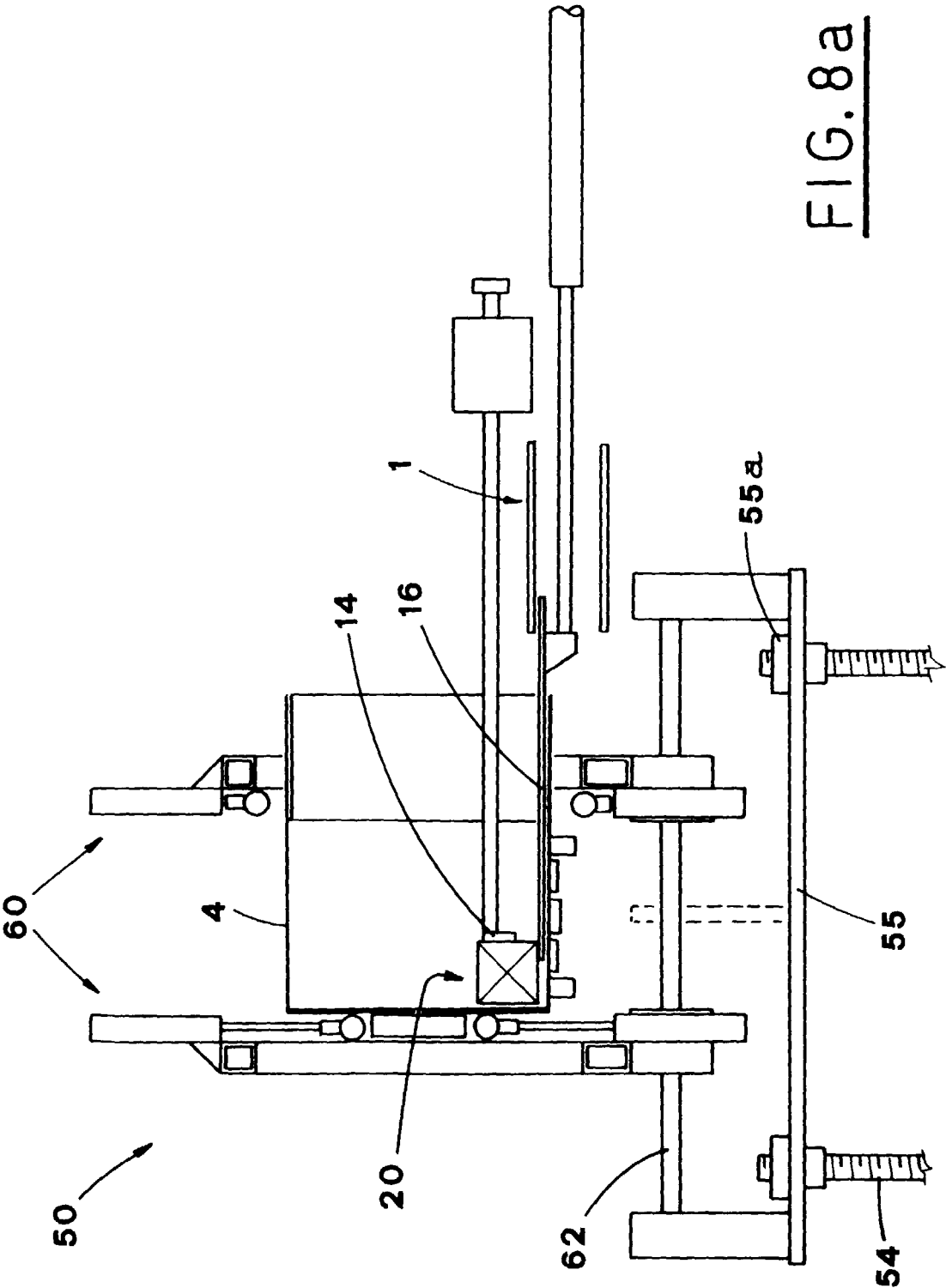
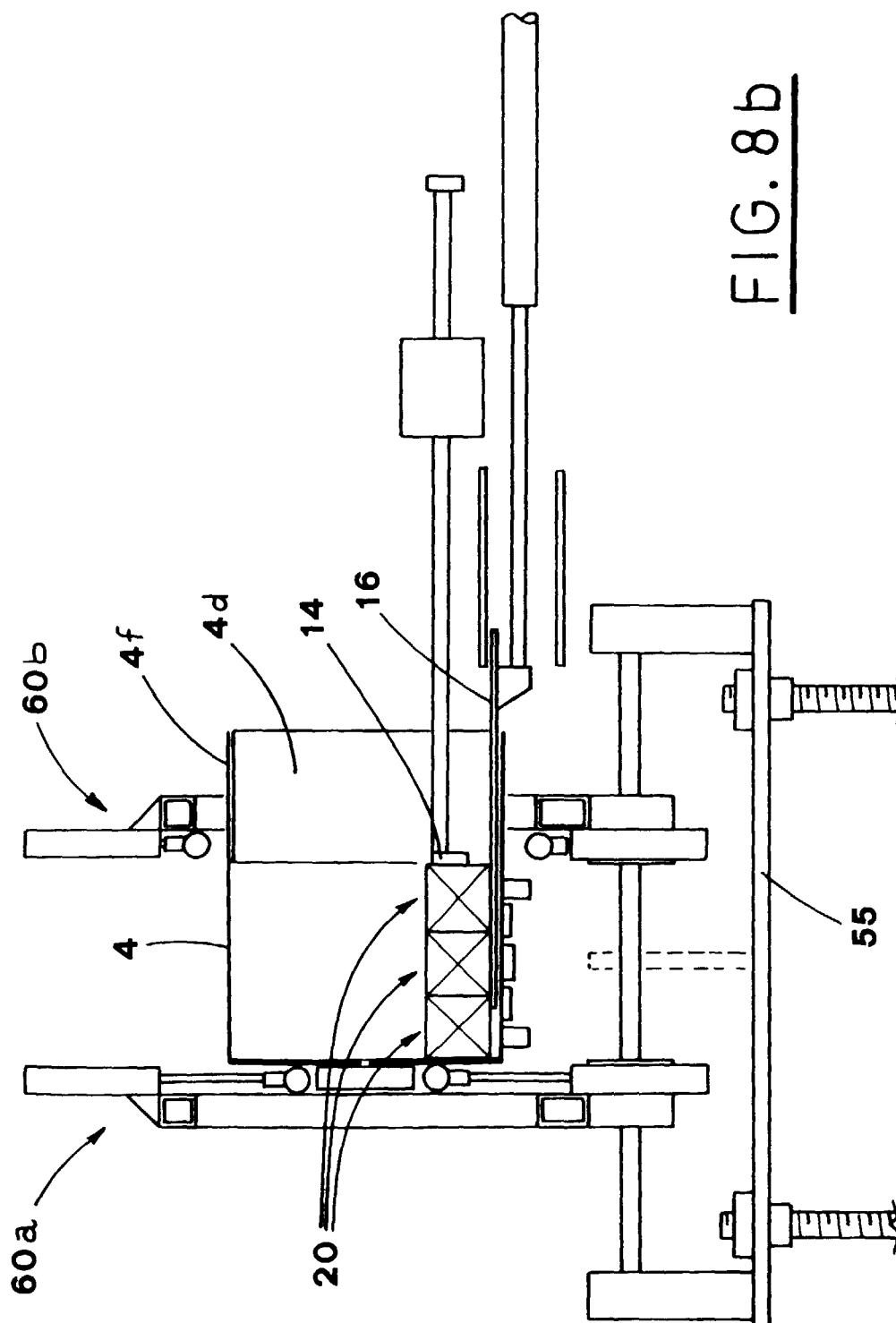
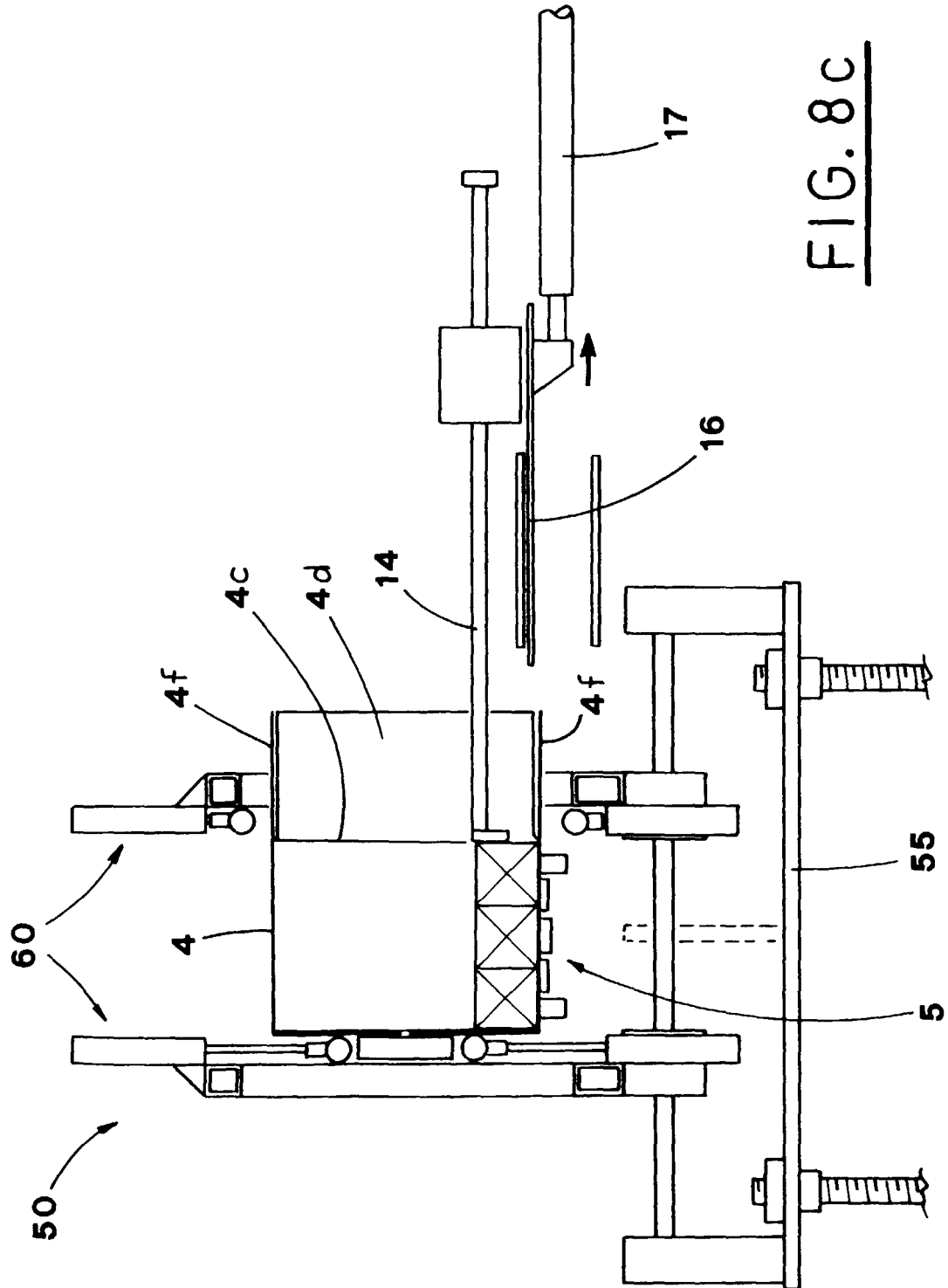


FIG. 7







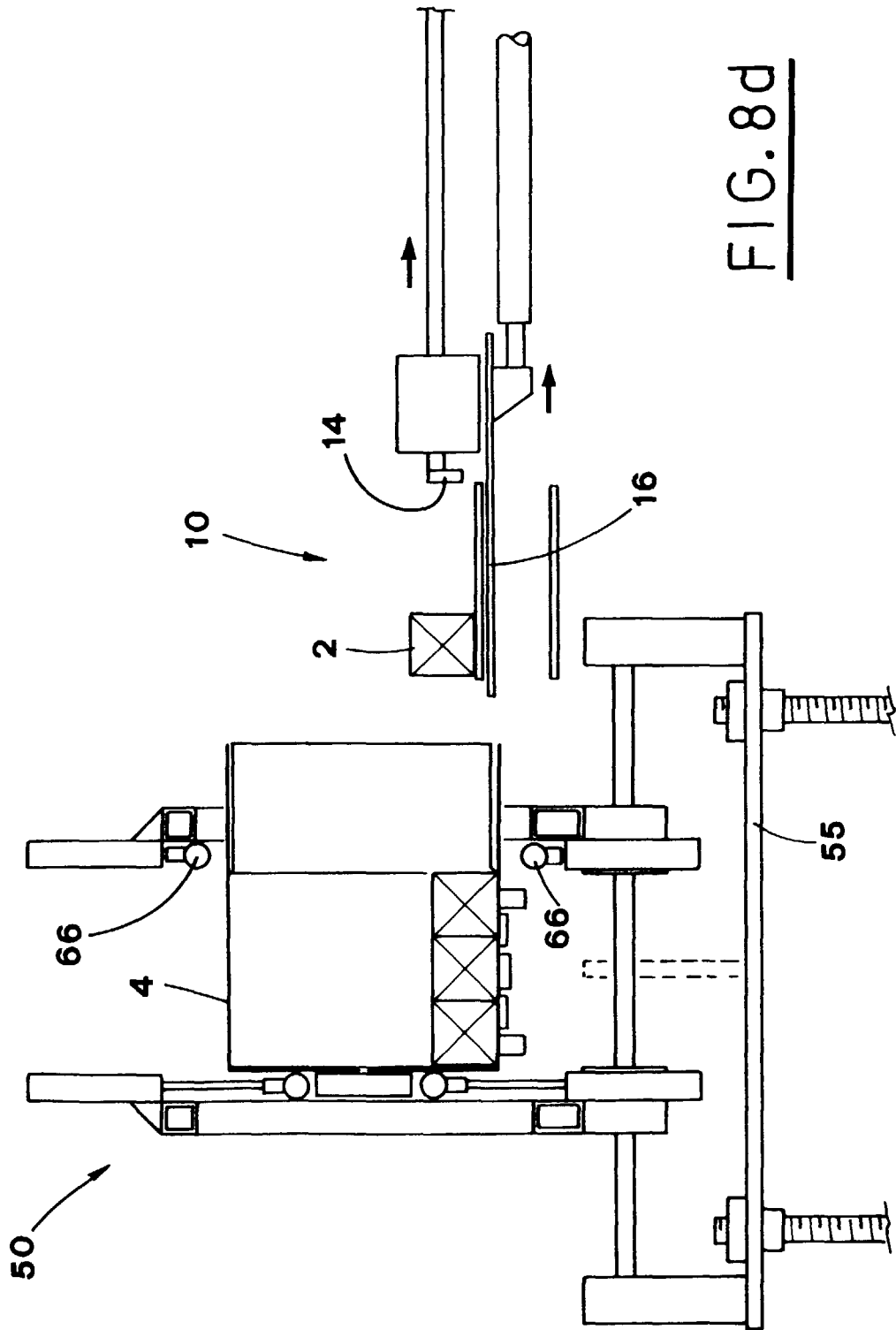
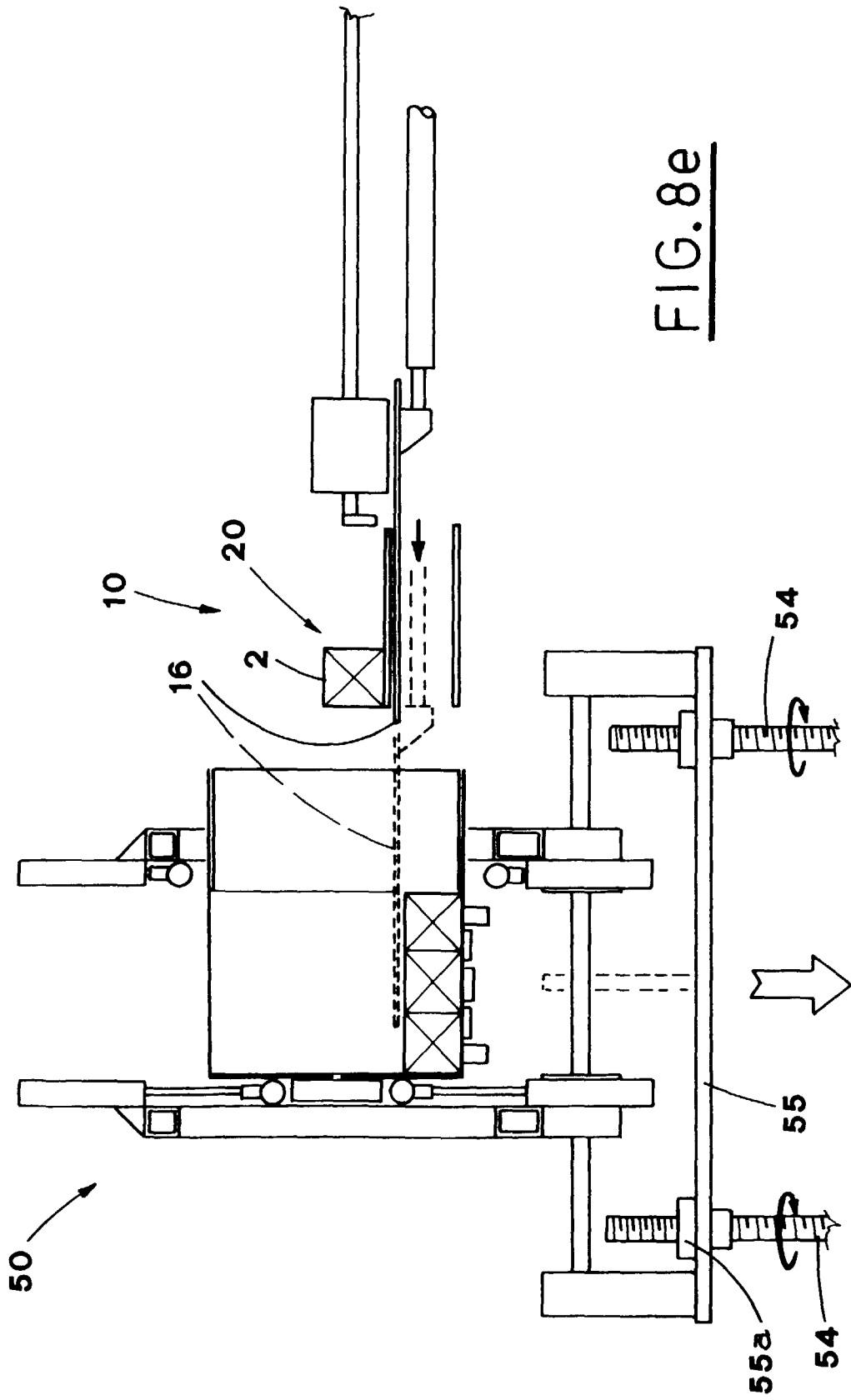
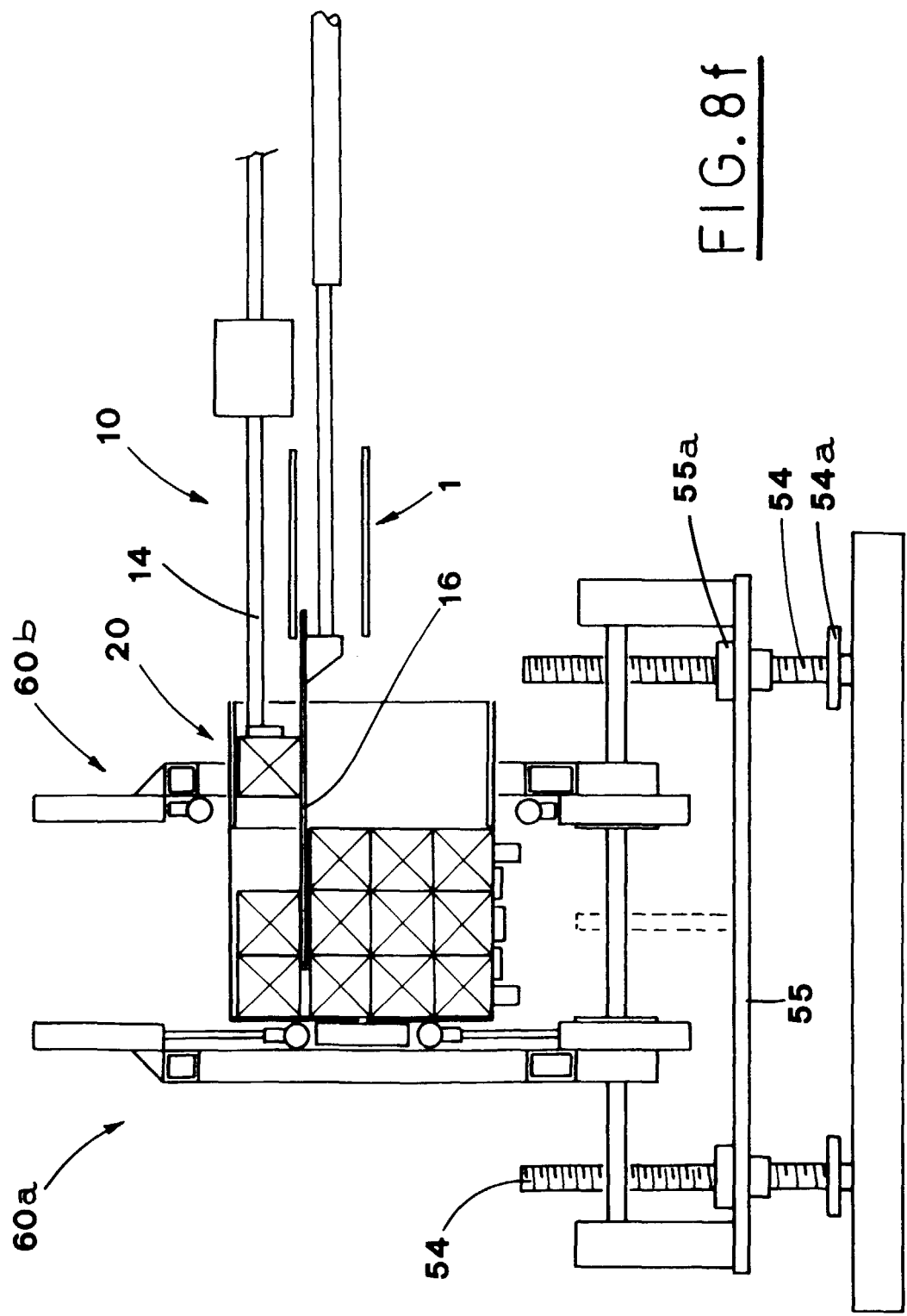
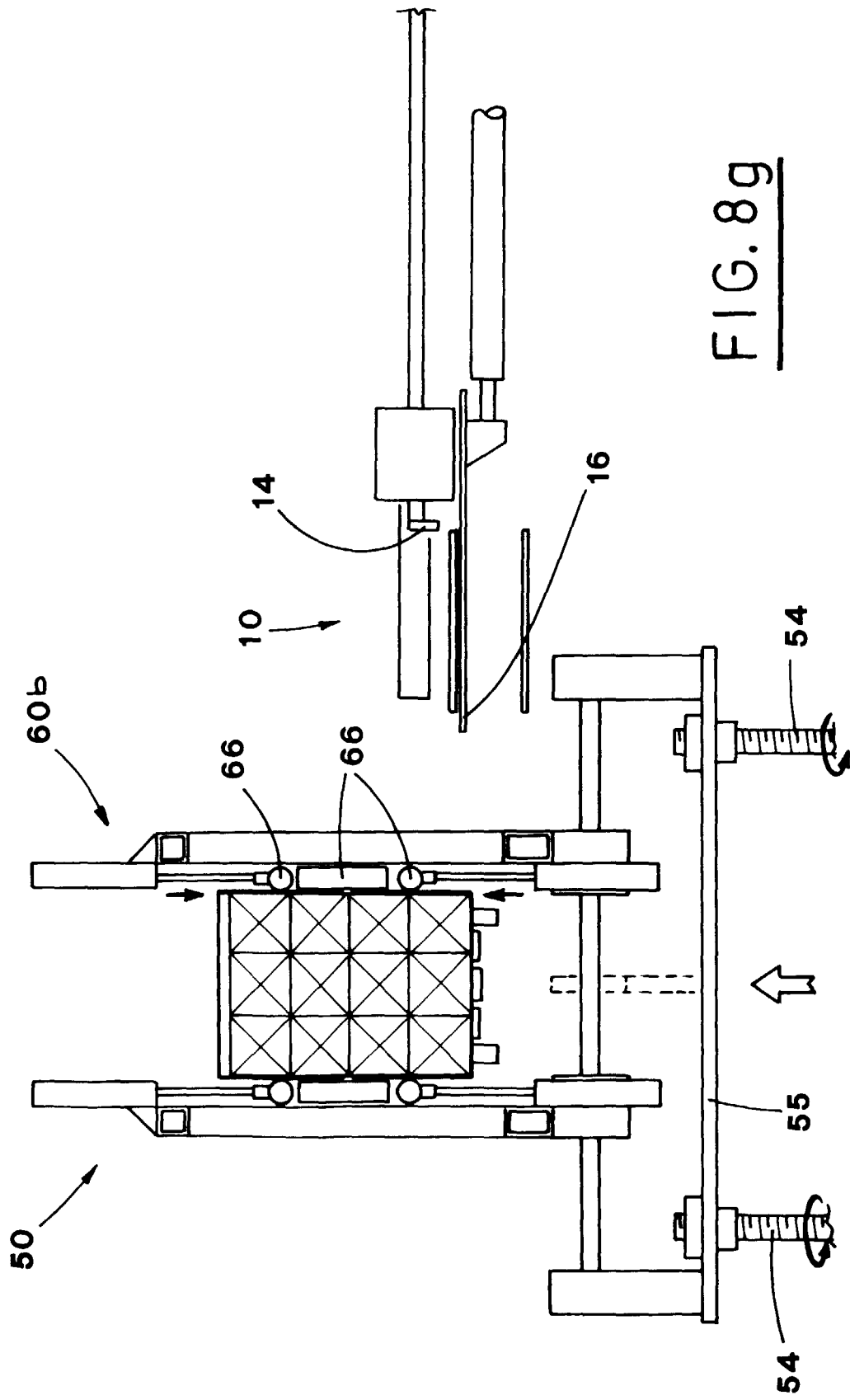
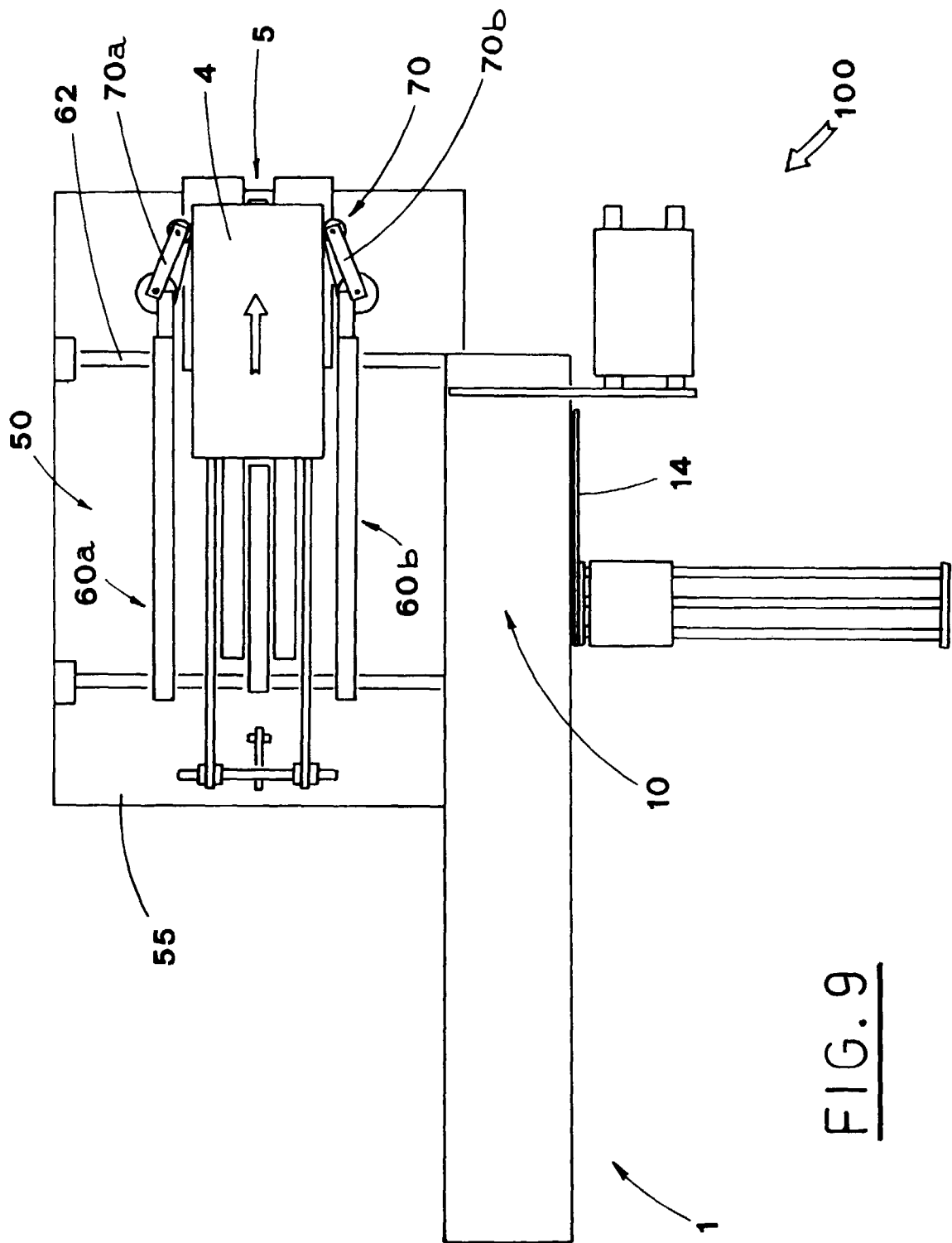


FIG. 8d











European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 5059

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 734 948 A (MONTI) 2 October 1996 (1996-10-02) * column 3, line 30 - column 8, line 29; figures 1-11 *	1-3	B65B5/10 B65B5/02 B65B59/00
A	US 5 732 536 A (INDUSTRIAL TECHNOLOGY RESEARCH) 31 March 1998 (1998-03-31) * abstract; figures 6B,7B *	1	
A	FR 2 622 534 A (LETARD) 5 May 1989 (1989-05-05)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 June 2000	Examiner Claeys, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503.03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 10 5059

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-06-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 734948 A	02-10-1996	IT B0950140 A	30-09-1996
		DE 69604718 D	25-11-1999
		DE 69604718 T	02-03-2000
		ES 2137653 T	16-12-1999
US 5732536 A	31-03-1998	NONE	
FR 2622534 A	05-05-1989	NONE	