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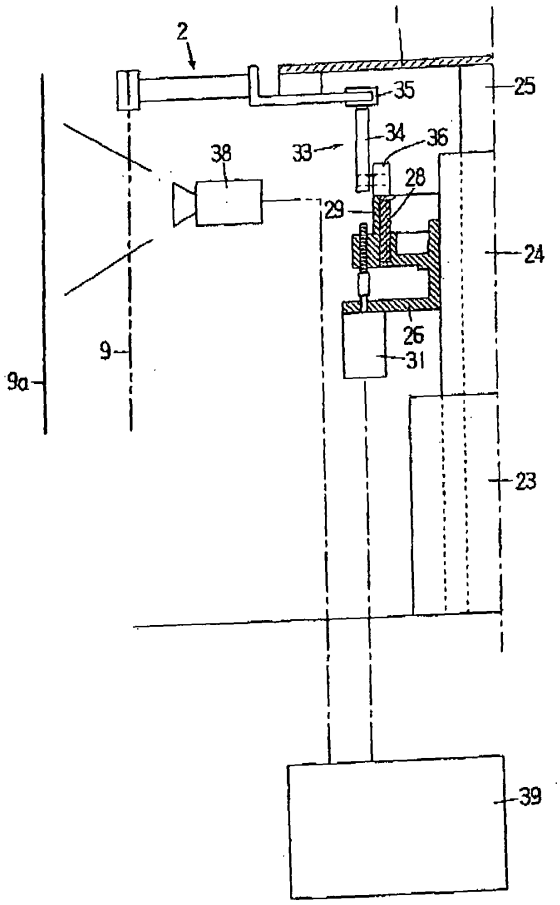
## (54) Bag filling and packaging method and bag filling and packaging apparatus

(57) A bag filling and packaging system including gripper pairs around a rotating table (1) so that the grippers (2, 3) of each gripper pair grip two side edges of a bag (9) on which various packaging processes are performed. A gripper distance adjustment auxiliary cam (29) is provided to ascend and descend relative to a gripper distance setting cam (28) for setting distance between grippers (2, 3). A roller (36) rolls on the two cams (28, 29) as the table (1) rotates, and the distance between the grippers (2, 3) changes in response to the height of the roller (36) by a transmission mechanism (34, 35). An apparent bag width is measured prior to gripping a bag (9), the height of the gripper distance adjustment auxiliary cam (29) is controlled according to this measured value, and the distance between grippers (2, 3) in a bag supply process is adjusted accordingly, the amount of part gripped by the grippers (2, 3) at side edges of a bag (9) thus being constant for all bags.

**FIG. 4**

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## Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

**[0001]** The present invention relates to a bag filling and packaging apparatus including a plurality of gripper pairs, which are provided at equal distance about a carrying member (table or chain) that rotates continuously or intermittently along a circular path, for gripping both (left and right) side edges of a bag, wherein bags are supplied to the gripper pairs while the carrying member makes one revolution, and the bags gripped by the gripper pairs are sequentially subjected to such packaging processes as bag mouth opening, contents charging, and bag mouth sealing.

2. Description of the Related Art

**[0002]** A typical bag filling and packaging apparatus includes a table that has a plurality of gripper pairs provided about the circumference and rotates intermittently; and in this bag filling and packaging apparatus, various packaging processes are sequentially performed at various stop positions. Such processes include supplying of bags to the gripper pairs, printing on the bag surface(s) gripped by a gripper pair, bag mouth opening, contents charging, air removal or gas exchange, and bag mouth sealing.

**[0003]** In this bag filling and packaging apparatus, while the table is making one revolution, the degree of opening (or the distance) in the grippers of each one of the gripper pairs varies within some range. Generally, in the bag supply process, a distance $X_0$ (see Fig. 11) between two grippers is effected which is slightly narrower (smaller) than the widest distance; in the printing process, the widest distance $X_0 + \alpha$ is effected between two grippers; in the mouth opening process and charging process, the two grippers making the gripper pair are moved closer to each other and the distance in between is made narrowed to be $X_0 - \beta$; and, thereafter, the widest distance which is $X_0 + \alpha$ is again effected for the two grippers. In the above description, $\alpha$ is generally a small positive number and is smaller than $\beta$ ($\alpha < \beta$). The distance between the two grippers of the gripper pair is widened so that tensions are applied to the bag mouth to effect a condition of no looseness or wrinkle in the bag. On the other hand, the gripper pair is (or the two grippers thereof are) moved closer to each other, narrowing the distance so as to open the bag mouth. The distance between the grippers is set slightly narrower in the bag supply process, because, generally, the bags supplied to the gripper pair in the bag supply process are slightly loose and not in a condition that they are tensioned tightly in the width direction.

**[0004]** In this type of bag filling and packaging apparatus, as described in Japanese Patent Application Laid-Open (Kokai) No. H09-95318, a full-circumference cam (gripper distance setting cam) for adjusting the distance between two grippers of a gripper pair is provided, with its cam face oriented upward, about the circumference of the rotary shaft of the table so as to be ascendable and descendable. The full-circumference cam (gripper distance setting cam) rotates together with the table when the table rotates, and it rotates backward to its original position when the table stops. A spring is provided for each gripper pair so that the spring urges two grippers of the gripper pair in a direction that narrows the distance between the grippers. In addition, a transmission mechanism having a roller at its end is provided for each gripper pair. The roller is pushed against the cam surface by the urging force of the spring and rotates on the cam surface when the cam makes the backward rotation. Accordingly, the distance between the grippers (distance between the two grippers of each of the gripper pairs) is set, against the urging force of the springs, to be a distance that accords with the height of the cam surface in the sequence of $X_0$ (slightly narrower (smaller) than largest distance) $\rightarrow X_0 + \alpha$ (largest distance) $\rightarrow X_0 - \beta$ (narrower (smaller) than the largest distance) $\rightarrow X_0 + \alpha$ (largest distance).

**[0005]** As described in the above-described Japanese Patent Application Laid-Open (Kokai) No. H09-95318, the height of the gripper distance setting cam is adjustable, so that, when the bag size (bag width) varies, the cam height is adjusted accordingly, and the distance between the grippers is changed to one that corresponds to the bag width to be worked. The numerical value of this bag width is generally the width of the bag mouth when the bag is substantially flat (such is called a "nominal value" of bag width in the present invention), and the distance between grippers for each process is set on the basis of this nominal value. In the present invention, the distance between grippers set on the basis of the nominal value is called a "reference value."

**[0006]** The distance between grippers (reference value) set for a particular bag width (nominal value) is generally not changed so long as bags having such a bag width are processed.

**[0007]** If the bags that are worked are ordinary flat bags, then the bag width of the bags, when they are actually supplied to the gripper pairs, takes substantially the nominal value. However, depending on the types of bags, some have bag surfaces that are warped or distorted (such warping or distortion often occurring in spout-equipped bags and zipper-equipped bags). In such bags, the apparent bag width (the bag width measured without correcting the warping or distortion) is narrower than the actual width, even if the nominal value of the bag width is the same, and there are differences in apparent bag widths. When such bags are used in packaging, problems would arise. Since the amount of parts gripped by grippers (a width of a bag edge that is gripped) is small, it is difficult to sufficiently tension the bag mouth when, for instance, sealing the bag (the bag mouth will not be sufficiently tensioned even when the distance be-

tween the grippers (of a gripper pair) is widened to the reference value).

**[0008]** This matter will be described below with reference to Figs. 11 and 12.

**[0009]** Fig. 11 shows a gripper pair stopped at a bag supply position. The reference numeral 1 is a table that rotates intermittently, and a pair of grippers 2 and 3 are supported by pins 4 so that they pivot horizontally. The reference numerals 5 are chucks for holding bags, and 6 refers to a spring that urges the pair of grippers 2 and 3 inwardly (or urges toward each other). A latching pin 7 secured to the back end of the gripper 2 mates in a long hole 8 formed in the back end of the gripper 3, so that two (or the pair of) grippers 2 and 3 pivot simultaneously. This structure is known conventionally.

**[0010]** For the pair of grippers 2 and 3, a bag 9 (a bag prior to being gripped is referred to by 9a) is supplied by a bag feeder (not shown) to the chucks 5 and 5 that are open as indicated by dashed lines, and the bag 9 is gripped by the chucks 5 and 5 as shown by solid lines. The bag mouth of the bag 9a is flat, and its bag width is $W_0$ (identical with the nominal value); and thus the bag is gripped by the chucks 5 and 5, keeping the bag width $W_0$ "as is." The distance between the grippers 2 and 3 in this process is set to be the reference value $X_0$, and thus the amount $S_0$ of the part gripped is basically $W_0$-$X_0$) / 2. When the grippers 2 and 3 move to the printing process or sealing process, and the distance between the grippers 2 and 3 widens to be the reference value $X_0$ + $\alpha$, the mouth of the bag 9 is tensioned or pulled sideways.

**[0011]** Fig. 12 shows the manner of gripping for the case where warping or distortion exists in the bag 9 (the bag prior to being gripped is referred to by 9a) supplied to the pair of grippers 2 and 3 for which the bag width for the bag supply process is set to be the same reference value $X_0$. The apparent bag width W of the bag 9a having warping or distortion is equal to or below the nominal value $W_0$, and the bag 9a is gripped by the chucks 5 and 5 keeping the bag width W; accordingly, in this case, the amount S of the part gripped which are at side edges of the bag is smaller ($S < S_0$). Furthermore, when this pair of grippers 2 and 3 next moves to the printing process or sealing process, even if the distance between the (pair of) grippers 2 and 3 widens to the reference value $X_0$ + $\alpha$ in such printing process or sealing process, depending on the size of the apparent bag width W, it may be impossible to sufficiently tension the bag mouth of the bag 9, and the bag mouth would remain loose.

**[0012]** When the amount of part gripped by grippers is small, the gripping force is weak, and there is a danger that the bag comes away from the grippers when contents are charged therein. Furthermore, when the bag mouth is not sufficiently tensioned, the bag mouth will not be closed sufficiently, making air removal and gas replacement defective, and causing sealing defects.

## SUMMARY OF THE INVENTION

**[0013]** Accordingly, the object of the present invention is to solve the above-described problems with the conventional art conventional art, and the present invention provides a bag filling and packaging method and apparatus which is free of the problems of the conventional art, even in cases that bags having warping or distortion in the bag surfaces and having bag width of below the nominal value are involved.

**[0014]** More specifically, the present invention is for a bag filling and packaging method and apparatus in which a plurality of gripper pairs, for gripping the left and right side edges of bags, are provided at equal distance about a carrying member that rotates continuously or intermittently along a circular path, and while the carrying member makes one revolution, bags are supplied to the gripper pairs, the bags gripped by the gripper pairs are subjected sequentially to such packaging processes as bag mouth opening, contents charging, and bag mouth sealing; and the present invention can be categorized into four: a bag filling and packaging method (1) and apparatus (2) that maintains the amount of part gripped by a gripper pair at bag side edges constant, and a bag filling and packaging method (3) and apparatus (4) that, when the distance of two grippers (of a gripper pair) is widened and the bag mouth is thus tensioned, maintains the degree of tension in the bags constant.

**[0015]** The above described bag filling and packaging method (1) that maintains the amount of part gripped by a gripper pair at bag side edges constant is characterized in that the apparent bag width of each one of the bags supplied to a gripper pair in the bag supply process is measured prior to the gripping action on the bag by a gripper pair; the distance between two grippers (of the gripper pair) when the gripper pair grips the two side edges of a bag is adjusted according to the measured value; so that the amount of part gripped by grippers at the side edges of a bag is constant for all the bags to be processed.

**[0016]** In this bag filling and packaging method, for example, based on a nominal bag width value, a reference value is set for the distance between the grippers for each one of the processes; and the distance between the grippers, when the gripper pair grips the two side edges of a bag in a bag supplying process, is set to be adjustable to a size equal to or below the reference value.

**[0017]** The above-described bag filling and packaging apparatus (2) that executes the method (1) described above is characterized in that

a reference value, based on the nominal bag width value, is set for the distance between grippers of each gripper pair corresponding to each one of the processes, and

it is made possible to adjust the distance between the grippers, when the gripper pair grips the two side edges of a bag in a bag supplying process, to a size equal to or below the reference value; and

this bag filling and packaging apparatus (2) includes:

a bag width measurement means for measuring the apparent bag width of each one of the bags supplied to gripper pair in the bag supply process prior to gripping the bag by the gripper pair,

a gripper distance adjustment means for adjusting the distance between the grippers of the gripper pair when the gripper pair grips the two side edges of a bag, and

a control means for controlling the gripper distance adjustment means according to the bag width measurement values and adjusting the distance between the grippers to a value equal to or below the reference value so that the amount of part gripped by gripper pairs at side edges of a bag becomes a prescribed value.

**[0018]** In this apparatus, for example,
the carrying member is a revolving table;
a gripper distance setting cam for setting the distance between the grippers to a reference value is provided to surround the circumference of a table rotating shaft, the upper surface of the gripper distance setting cam making a cam surface;
as the above-described gripper distance adjustment means, a gripper distance adjustment auxiliary cam and a drive mechanism are provided, wherein the gripper distance adjustment auxiliary cam has on its upper surface a cam surface and is provided so as to be ascendable and descendable relative to the gripper distance setting cam at predetermined positions in the circumferential direction of the gripper distance setting cam, and the drive mechanism causes the gripper distance adjustment auxiliary cam to ascend and descend;
an urging means is provided in each gripper pair for urging the grippers so as to narrow the distance between the grippers; and
a transmission mechanism is provided in the above-described table, for each gripper pair, so that the transmission mechanism, including a roller that rolls along the cam surfaces of the above-described two types of cams, transmits the displacement of the roller, against the urging force, to the gripper pair and opens the grippers to a distance that corresponds to the heights of the cam surfaces.

**[0019]** The bag filling and packaging method (3) that, when the distance of a gripper pair is widened and the bag mouth is thus tensioned, maintains the degree of tension constant is characterized in that the apparent bag width of each one of the bags is measured and the distance between grippers of a gripper pair is adjusted, according to the measured value, when, in one or more processes after the bag supplying process, the distance between the grippers is widened to be greater than the distance of grippers in the bag supplying process so that the degree of bag tension at that time is constant for all of the bags.

**[0020]** In this bag filling and packaging method, the apparent bag width can be measured any time so long as it is a timing wherein the apparent bag width for individual bags can be properly measured. Such a timing is, for example, before a bag supplied to a gripper pair in the bag supply process is gripped or after it is gripped, or prior to widening the gripper distance in a process (the printing process, for example) following the bag supply process, or, if the gripper distance is maintained without widening it in the process following the bag supply process, then the time period of such process. In other words, such a timing is a time period extending from prior to a bag being supplied to a gripper pair until the space distance of a gripper pair gripping a bag is changed from the initial distance (the point in time when the bag is gripped in the bag supply process).

**[0021]** In the method described above, for example, a reference value, based on the nominal bag width value, is set for a distance between grippers corresponding to each one of the packaging processes, and a distance between grippers of the gripper pair in one or more processes, for which a reference value greater than the reference value in the bag supplying process is set, is able to be set to be the size equal to or greater than the reference value in the one or more processes; and the apparent bag width of each one of the bags is measured, and a distance between grippers of the gripper pair is adjusted, according to the measured value of the apparent bag width in the one or more processes after the bag supplying process, to a size equal to or greater than the reference value in the one or more processes, so that the degree of bag tension in the one or more processes after the bag supplying process is constant for all of bags.

**[0022]** The above-described bag filling and packaging apparatus (4) is an apparatus that executes the above-described method (3); and this bag filling and packaging apparatus (4) is characterized in that
a reference value, based on a nominal bag width value, is set for the distance between grippers corresponding to each one of the processes, and
it is made possible to adjust the distance between grippers in one or more processes for which a reference value greater than the reference value in the bag supplying process is set to be a size equal to or greater than the reference value in that process or those processes; and this bag filling and packaging apparatus (4) includes:

a bag width measurement means for measuring the apparent bag width of each one of the bags,

a gripper distance adjustment means for adjusting the distance between the grippers in the above-described one or more processes after the bag supplying process, and

a control means for controlling the gripper distance adjustment means, according to the bag width measurement value, and for adjusting the distance between the grippers, in the above-described one or more processes after the bag supplying process, to a value that is greater than the above-described reference value by the difference between the nominal

value and the measured value.

**[0023]** In this apparatus, for example,
the carrying member is a revolving table;
a gripper distance setting cam for setting the distance between the grippers to a reference value is provided to surround the circumference of a table rotating shaft, the upper surface of the gripper distance setting cam making a cam surface;
as the above-described gripper distance adjustment means, a gripper distance adjustment auxiliary cam and a drive mechanism are provided, wherein the gripper distance adjustment auxiliary cam has on its upper surface a cam surface and is provided so as to be ascendable and descendable relative to the gripper distance setting cam at predetermined positions in the circumferential direction of the gripper distance setting cam, and the drive mechanism causes the gripper distance adjustment auxiliary cam to ascend and descend;
an urging means is provided in each gripper pair for urging the grippers so as to narrow the distance between the grippers; and
a transmission mechanism is provided in the above-described table, for each gripper pair, so that the transmission mechanism, including a roller that rolls along the cam surfaces of the above-described two types of cams, transmits the displacement of the roller, against the urging force, to the gripper pair and opens the grippers to a distance that corresponds to the heights of the cam surfaces.

**[0024]** As seen from the above, according to the present invention, even a case that there is warping or distortion in the bag surface, and even when there are bags that have an apparent bag width which is smaller than the nominal value, a danger that a bag comes away from the grippers when the amount of part gripped by grippers is small and contents are charged is prevented; and further, such problems as defective printing, defective air removal, defective gas replacement, and defective seals, that are caused when bag mouth tension is not sufficiently obtained, is also prevented.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

**[0025]**

Fig. 1 is a perspective view of a bag filling and packaging apparatus according to the present invention;
Fig. 2 shows in cross section the gripper distance setting cam and a gripper distance adjustment auxiliary cam, as well as a drive means for the gripper distance adjustment auxiliary cam in the bag filling and packaging apparatus of the present invention;
Fig. 3 is a side elevation thereof;
Fig. 4 shows in cross section the gripper distance adjusting mechanism in the bag filling and packaging apparatus of the present invention;
Fig. 5 is an expanded diagram of the gripper distance setting cam and gripper distance adjustment auxiliary cam according to the first embodiment of the present invention, Fig. 5 showing also the positions of various processes;
Fig. 6 is an expanded diagram of the gripper distance setting cam and gripper distance adjustment auxiliary cam according to the first embodiment of the present invention, Fig. 6 showing also the positions of various processes;
Fig. 7 is a top view showing the distance between grippers (in a bag supply process) according to the first embodiment of the present invention;
Fig. 8 is an expanded diagram of the gripper distance setting cam and gripper distance adjustment auxiliary cam according to the second embodiment of the present invention, Fig. 8 showing also the positions of various processes;
Fig. 9 is an expanded diagram of the gripper distance setting cam and gripper distance adjustment auxiliary cam according to the second embodiment of the present invention, Fig. 9 showing also the positions of various processes;
Fig. 10 is a top view showing the distance between grippers (in a steam blowing process) according to the second embodiment of the present invention;
Fig. 11 illustrates, using a top view of a gripper pair, problems, in a conventional bag filling and packaging apparatus, when the apparent bag width of a bag differs from a nominal value;
Fig. 12 illustrates, using a top view of a gripper pair, problems, in a conventional bag filling and packaging apparatus, when the apparent bag width of a bag differs from a nominal value;
Fig. 13 is an expanded diagram of a gripper distance setting cam and gripper distance adjustment auxiliary cam of a conventional bag filling and packaging apparatus, Fig. 13 showing also the positions of various processes.

## DETAILED DESCRIPTION OF THE INVENTION

**[0026]** The bag filling and packaging methods and packaging apparatus according to the present invention will be described below specifically with reference to Figs. 1 to 10.

### First Embodiment

**[0027]** First, the packaging method and packaging apparatus that maintains the amount of part gripped by a gripper pair at bag side edges constant for all bags will be described.

### Overall Configuration of Rotary Type Bag Filling and Packaging Apparatus

**[0028]** In the rotary type bag filling and packaging ap-

paratus shown in Fig. 1, a plurality of pairs of grippers 2 and 3 (only the chucks 5 and 5 thereof being shown in Fig. 1) for gripping the left and right side edges of each one of the bags 9 and suspending such bags are provided at equal distance along the circumference of a table 1 that intermittently or continuously rotates (in the rotating direction being shown by arrow).

**[0029]** At the various process positions A to J along the circumference of the table 1, various devices are provided. A conveyor magazine type bag feeder 11 is provided at position A, a printer (not shown) is provided at position B, a bag mouth opening device (only a pair of suction plates 12 thereof being shown) and a guide device (only guide members 13 thereof being shown) for holding the bag mouth in an opened state are provided at position C. A solid material feeder (only a hopper 14 thereof being shown) is provided at position D, a liquid material feeder (only a charging nozzle 15 thereof being shown) is provided at position E, and a steam blower (only a blower nozzle 16 thereof being shown) is provided at position F. Furthermore, a bag mouth initial sealing device (only hot plates 17 thereof being shown) is provided at position G, a bag mouth second sealing device (only hot plates 18 thereof being shown) is provided at position H, and a cool sealing device (only cooling plates 19 thereof being shown) and a product discharge chute 21 are provided at position I. Defective bags are discharged at position J.

**[0030]** In operation of this bag filling and packaging apparatus, at position A, a bag 9 is supplied from the conveyor magazine type bag feeder 11 to a pair of grippers 2 and 3 (chucks 5), which are not in motion, so that the bag 9 is chuck-held by the grippers 2 and 3 having the bag 9, and, at position B after the grippers 2 and 3 (chucks 5) have moved thereto, printing is done on the bag surface of the bag 9 by a printer (not shown).

**[0031]** At position C, after the grippers 2 and 3 (chucks 5) have moved thereto, the bag 9 is opened by the pair of suction plates 12. Then, the guide members 13 that until then were in an upper (raised) position (withdrawn position) pivot down and enter the bag 9. The guide members 13 are then moved in mutually opposite directions or in substantially the radial direction of the table 1, so that the opened state of the bag mouth opened by the pair of suction plates 12 is maintained. Following this opening action, the suction of the pair of suction plates 12 is stopped, and the suction plates 12 are withdrawn from the bag surface of the bag 9.

**[0032]** When the table 1, next, rotates, the guide members 13 also rotate to follow the rotation of the table 1, thus moving to position D.

**[0033]** At position D, a hopper 14 descends from above toward the bag mouth held in the opened state by the guide members 13, the lower end of the hopper 14 is brought into the bag mouth, solid material 22 is then introduced into the hopper 14, and the interior of the bag 9 is charged with the solid material 22. During this operation, the guide members 13 ascend, being pulled out of the bag 9, and make a rotational movement back to position C for the next bag.

**[0034]** At position E, a charging nozzle 15 is inserted into the bag mouth of the bag 9, steam is blown into the bag interior, and the air inside the bag 9 is replaced therewith.

**[0035]** At positions G and H, bag mouth sealing is performed by the hot plates 17 at position G and by the hot plates 18 at position H. At position I, the sealed bag mouth is cooled by cooling plates 19. Next, the finished bag 9A is released from the pair of grippers 2 and 3, dropped onto the product discharge chute 21, and discharged out from the packaging apparatus.

**[0036]** At position J, defective bags (no charging or the like being performed for bags detected to be defective bags) are released from the pair of grippers 2 and 3 and dropped.

**[0037]** The configuration and functions of the bag filling and packaging apparatus described above are the same as those of a conventional apparatus.

Distance Setting and Adjusting Mechanism for Grippers

**[0038]** As shown in Figs. 2 to 4, a hub 23 is provided to stand on a machine base (not shown), a follower shaft 24 is provided in the hub 23 so that the follower shaft 24 rotates on the inner circumferential side of the hub 23. A rotary shaft 25 for rotating the table 1 is provided in the follower shaft 24 so that the rotary shaft 25 rotates relative to the follower shaft 24 on the inner circumferential side of the follower shaft 24.

**[0039]** On the outer circumference of the follower shaft 24, a cam receiver 26 is attached so that it can freely slide, only in the up-and-down direction, by a rotating-prevention key 27. On the outer circumferential side of the cam receiver 26, a gripper distance setting cam 28 is secured; and, at a predetermined position in the circumferential direction of the gripper distance setting cam 28, a gripper distance adjustment auxiliary cam 29 is provided so that it is movable up and down in a vertical direction. The gripper distance adjustment auxiliary cam 29 is driven so as to ascend and descend along guide rods 30 erected on the cam receiver 26 by a servo motor 31, which is secured to the cam receiver 26, and by a threaded shaft 32, which is secured to the rotary shaft of the servo motor 31 and is screwed into a base 29a of the gripper distance adjustment auxiliary cam 29. The cam receiver 26 can ascend and descend by an elevator means (not shown).

**[0040]** The follower shaft 24 (and the gripper distance setting cam 28 attached to the follower shaft 24 and the gripper distance adjustment auxiliary cam 29 as well) rotates to follow the rotation of the table 1, and it rotates backward to its original position when the table 1 is stopped.

**[0041]** In the table 1, a transmission mechanism 33 is provided for each pair of grippers 2 and 3 (see Fig. 4). This transmission mechanism 33 is comprised of, similar

to that of the above-described Japanese Patent Application Laid-Open (Kokai) No. H09-95318, an L-shaped lever 34 and rollers 35 and 36. The L-shaped lever 34 is axially supported at its bent part in the table 1, and the rollers 35 and 36 are attached to the upper and lower ends thereof, respectively. The roller 35 is in contact with a tail end 2a of the gripper 2 (see Fig. 11), while the roller 36 rolls along the cam surfaces of the gripper distance setting cam 28 and gripper distance adjustment auxiliary cam 29. When the roller 36 is displaced in the height direction on the cam surfaces of the gripper distance setting cam 28 and gripper distance adjustment auxiliary cam 29, this displacement is transmitted through the L-shaped lever 34 and the roller 35 to the pair of grippers 2 and 3, and the grippers 2 and 3 are opened (or separated from each other), against the urging (spring) force of the spring 6 (see Fig. 11), to a distance that is in accordance with the height of the roller 36 (such "height" being the above-described cam surface height). More specifically, the apparatus is set so that the higher the cam surface height, the wider (lager) the distance between the grippers 2 and 3 becomes.

Function of Conventional Distance Setting Mechanism

**[0042]** Before describing the function of the above-described gripper distance setting cam 28 and gripper distance adjustment auxiliary cam 29 employed in the bag filling and packaging apparatus of the present invention, a conventional gripper distance setting cam (the gripper distance adjustment auxiliary cam 29 not being employed conventionally) will be described with reference to Fig. 13 (and Fig. 1), using the reference numbers and symbols of Fig. 1 without alteration.

**[0043]** The conventional gripper distance setting cam 28A, similar to the gripper distance setting cam 28 of the present invention, is secured to a cam receiver 26 that is attached, so as to ascend and descend, to a follower shaft 24 provided on the circumference of the rotary shaft 25 of a table 1; and it rotates so as to follow the rotation of and together with the table 1 and rotates backward to its original position when the table 1 stops. The height of the gripper distance setting cam 28A is set on the basis of the width of the bag processed.

**[0044]** Fig. 13 shows the gripper distance setting cam 28A extended, and it also shows the position of the roller 36 at each one of the above-described processes A to J.

**[0045]** In Fig. 13, the positions of the gripper distance setting cam 28A and roller 36 when the rotation of the rotary shaft 25 of the table 1 has just stopped and the roller 36 has stopped simultaneously are shown in (a); and in (b), the positions of the gripper distance setting cam 28A and roller 36 when, continued from (a), the follower shaft 24 has rotated backward are shown. As seen from Fig. 13, the gripper distance setting cam 28A has a slightly lower recess (first or shallow recess) 28Aa and a much lower recess (second or deep recess) 28Ab.

**[0046]** At the point in time when the pair of grippers 2 and 3 stop at the bag supply process position A, the distance between the grippers 2 and 3 is $X_0 + \alpha$ (see the description in above "Background of the Invention"). Then, when the gripper distance setting cam 28A rotates backward, the roller 36 rolls into the first (shallow) recess 28Aa, and the distance between the pair of grippers 2 and 3, as a result, becomes $X_0$; and, at this point in time, a bag is supplied to the pair of grippers 2 and 3 and held thereby.

**[0047]** Next, the table 1 rotates, and when the pair of grippers 2 and 3 stop at the printing process position B, the distance between the pair of grippers 2 and 3 is still $X_0$; however, when the gripper distance setting cam 28A then rotates backward, the roller 36 comes out of the first (shallow) recess 28Aa, and the distance between the grippers 2 and 3 becomes $X_0 + \alpha$, so that the bag gripped by the pair of grippers 2 and 3 attains a tensioned condition and the bag mouth is pulled tight.

**[0048]** The table 1 further rotates, and when the pair of grippers 2 and 3 stop at the bag mouth opening process position C, the distance between the grippers 2 and 3 is still $X_0 + \alpha$; however, when the gripper distance setting cam 28A rotates backward, the roller 36 rolls into the second (deep) recess 28Ab. As a result, the distance between the grippers 2 and 3 narrows to be $X_0$-$\beta$, and the bag gripped by the pair of grippers 2 and 3 attains a condition that the bag mouth is loose.

**[0049]** To briefly describe the distance between the pair of grippers 2 and 3 at positions D to J (after the gripper distance setting cam 28A making the backward rotation), the distance $X_0$-$\beta$ is kept up to position E, and then the distance becomes to be $X_0 + \alpha$ at position F, and the distance $X_0 + \alpha$ is kept up to position J.

**[0050]** When the distance described above for the pair of grippers 2 and 3 in the various process is set appropriately based on the bag width (nominal value) of the bags processed, this distance is basically not changed so long as those (same size) bags continue to be processed. Accordingly, in the present invention, this distance is called the "reference value."

Function of Distance Setting and Distance Adjusting Mechanism in the Present Invention

**[0051]** The gripper distance setting cam 28 and the gripper distance adjustment auxiliary cam 29, which is provided at predetermined positions in the circumferential direction of the gripper distance setting cam 28 so as to be ascendable and descendable relative to the gripper distance setting cam 28, employed in the bag filling and packaging apparatus of the present invention will be described with reference to Figs. 5 to 7 and Figs. 1 to 4.

**[0052]** In the processes at positions B to J, the distance between the grippers 2 and 3 is set by the gripper distance setting cam 28 so as to be the reference value based on the nominal value of the bag width. In the bag supply process at position A, the distance between the grippers 2 and 3 is adjusted, by the gripper distance adjustment

auxiliary cam 29 and drive means therefor, to an appropriate value equal to or below the reference value according to the apparent bag width (measured value) measured bag by bag.

**[0053]** Furthermore, as shown in Figs. 1 and 4, in the bag filling and packaging apparatus of the present invention, a camera 38 is provided at the bag supply process position A. This camera 38 detects, one bag at a time, the apparent bag width of the bags 9 that are suction-held by the bag-feeding suction device 37 of the bag feeder 11 and supplied to the pair of grippers 2 and 3. An image captured by the camera 38 is sent to a controller 39 (see Fig. 4), and the apparent bag width is measured by way of image processing. The controller 39 controls the drive of the servo motor 31 pursuant to this measured value, so that the gripper distance adjustment auxiliary cam 29 is made to ascend or descend, and the distance between the grippers 2 and 3 is adjusted (widened or narrowed) to be an appropriate value.

**[0054]** Figs. 5 and 6 shows the expanded gripper distance setting cam 28 and gripper distance adjustment auxiliary cam 29, as well as showing the positions of the roller 36 in the various process positions. The gripper distance adjustment auxiliary cam 29 is positioned at the bag supply process position A (and reciprocates between the positions A and B).

**[0055]** In Figs. 5 and 6, respectively, (a) shows the positions of the two cams 28 and 29 and the roller 36 when the rotation of the rotary shaft 25 of the table 1 has just stopped and the roller 36 has also stopped simultaneously; and (b), continued from (a), shows the positions of the two cams 28 and 29 and the roller 36 when the follower shaft 24 has rotated backward. In most of the processes, the roller 36 is positioned on the gripper distance setting cam 28; however, in the bag supply process (position A), the roller 36 is positioned on the gripper distance adjustment auxiliary cam 29. As shown in Figs. 5 and 6, the gripper distance setting cam 28 has a lower recess (first or shallow recess) 28a and a much lower recess (second or deep recess) 28b. The gripper distance adjustment auxiliary cam 29 is provided in parallel at the position of the recess 28a. Compared to the recesses 28Aa and 28Ab of the gripper distance setting cam 28A (see Fig. 13), the first (or shallow) recess 28a of the gripper distance setting cam 28 is considerably deeper than the first (or shallow) recess 28Aa of the gripper distance setting cam 28A, and the second (or deep) recess 28b of the gripper distance setting cam 28 is formed to have the same depth as the second (or deep) recess 28Ab of the gripper distance setting cam 28A.

**[0056]** Now, the nominal value of the bag width of the bags 9 is $W_0$, the amount of part gripped by the pair of grippers 2 and 3 is set to be So (so that it is constant for any and all bags), and the reference value for the distance between the grippers 2 and 3 in the bag supply process is set to be $X_0$. Here, $X_0 = W_0 - 2S_0$.

**[0057]** When the bag 9 is flat and the measured value of the bag width (the apparent bag width) is $W_0$ as the nominal value indicates, then the controller 39 controls the servo motor 31 to adjust the height of the gripper distance adjustment auxiliary cam 29, making adjustment so that the distance between the grippers 2 and 3 becomes the reference value $X_0$. Fig. 5 shows this situation, in which the height of the cam surface of the gripper distance adjustment auxiliary cam 29 is the same height as the first (shallow) recess 28Aa in Fig. 13.

**[0058]** As shown in Fig. 7, on the other hand, when there is warping or distortion in the bag 9, and the measured value of the bag width (the apparent bag width) is W (where $W < W_0$), in order to make the amount of part gripped by the grippers 2 and 3 to be $S_0$, the distance between the grippers 2 and 3 must be adjusted to be $X_0$-($W_0$- W), narrower than the reference value $X_0$. Dashed lines in Fig. 7 indicate the positions of the grippers 2 and 3 when the grippers 2 and 3 are opened (moved away from each other) to the reference value $X_0$. The controller 39 controls the servo motor 31, based on the measured value, to adjust the height of the gripper distance adjustment auxiliary cam 29, making adjustment so that the distance between the grippers 2 and 3 becomes $X_0$ - ($W_0$ - W). This condition is shown in Fig. 6. As seen from Fig. 6, the height of the cam surface of the gripper distance adjustment auxiliary cam 29 is slightly lower than the height of the cam surface of the gripper distance adjustment auxiliary cam 29 shown in Fig. 5.

**[0059]** As a result, even if the apparent bag width W differs from the nominal value $W_0$, or even if the apparent bag width W is different for each bag, the bags can always be gripped with the same (gripped) amount $S_0$.

Second Embodiment

**[0060]** Next, in the bag filling and packaging method and packaging apparatus according to the present invention, a packaging method and packaging apparatus in which when the bag mouth of a bag gripped by a gripper pair is tensioned by widening the gripper distance for the gripper pair, such tension is kept constant for (or applicable to) any and all bags will be described.

Distance Setting and Distance Adjusting Mechanism

**[0061]** As shown in Fig. 8, in a predetermined position in the circumferential direction of the gripper distance setting cam 28, a gripper distance adjustment auxiliary cam 41 is provided so as to be movable up and down in a configuration similar to the gripper distance adjustment auxiliary cam 29 in Figs. 5 and 6. The position where the gripper distance adjustment auxiliary cam 41 is provided, however, differs from that of the gripper distance adjustment auxiliary cam 29. The drive mechanism for moving the gripper distance adjustment auxiliary cam 41 up and down is the same as that for the gripper distance adjustment auxiliary cam 29. Accordingly, if, in Figs. 2 to 4, the gripper distance adjustment auxiliary cam 29 is replaced by the gripper distance adjustment auxiliary cam 41, Figs.

2 to 4 can be referred to in describing the second embodiment.

**[0062]** Figs. 8 and 9 show the expanded gripper distance setting cam 28 and gripper distance adjustment auxiliary cam 41, wherein the positions of the roller 36 at the various process positions are shown as well. The gripper distance adjustment auxiliary cam 41 is provided at the first sealing process position G (and reciprocates between the position G and position H).

Function of Distance Setting and Distance Adjusting Mechanism in the Present Invention

**[0063]** In the processes at the positions A to F and positions H to J, the distance between the grippers 2 and 3 is set to be the reference value based on the nominal value $W_0$ for the bag width; and in the first sealing process at position G, the distance between the grippers 2 and 3 is adjusted, by the gripper distance adjustment auxiliary cam 41 and the drive means therefor, to an appropriate value equal to or greater than the reference value, one bag at a time, according to the apparent bag width W (measured value) measured for each bag.

**[0064]** In Figs. 8 and 9, respectively, the positions of the two cams 28 and 41 and the roller 36 when the rotation of the rotary shaft 25 of the table I has just stopped and the roller 36 has stopped simultaneously are shown in (a), and, in (b), the positions of the two cams 28 and 41 and the roller 36 when, continued from (a), the follower shaft 24 has rotated backward are shown. In most of the processes, the roller 36 is positioned on the gripper distance setting cam 28; however, in the first sealing process (position G), the roller 36 is on the gripper distance adjustment auxiliary cam 41. The shape of the gripper distance setting cam 28 is the same as that of the conventional gripper distance setting cam 28A.

**[0065]** Now, the nominal value of the bag width of the bags 9 is set to be $W_0$, the reference value for the distance between the grippers 2 and 3 in the bag supply process is set to be $X_0$, the amount of part gripped by the pair of grippers 2 and 3 when the apparent bag width W of the bag 9 coincides with the nominal value $W_0$ is set to be $S_0$, and the reference value for the distance between the grippers 2 and 3 in the first sealing process (position G) is set to be $X_0 + \alpha$. Here, $X_0 = W_0 - 2S_0$.

**[0066]** When the bag 9 is flat and the measured value of the bag width W (the apparent bag width) measured by the camera 38 is $W_0$ as the nominal value indicates, then the controller 39 controls the servo motor 31 to adjust the height of the gripper distance adjustment auxiliary cam 41, so that the cam surface of the gripper distance adjustment auxiliary cam 41 coincides with the cam surface of the gripper distance setting cam 28, thus making adjustment that the distance between the grippers 2 and 3 becomes the reference value $X_0 + \alpha$. This situation is shown in Fig. 8.

**[0067]** When, on the other hand, there is warping or distortion in the bag 9, and the measured value W (apparent bag width) measured by the camera 38 is less than the nominal value ($W < W_0$), if the distance between the grippers 2 and 3 in the first sealing process (position G) is still the reference value $X_0 + \alpha$ as indicated by dashed lines in Fig. 10, then the bag mouth tension is insufficient. Thus, in order to apply tensions to the bag mouth of the bag having the apparent bag width W (where $W < W_0$), in the first sealing process, as the same degree of tension as for a bag having a bag width of the nominal value $W_0$, the distance between the grippers 2 and 3 must be adjusted so as to be $X_0 + \alpha + (W_0 - W)$, which is wider than the reference value $X_0 + \alpha$. As a result, the controller 39 controls the servo motor 31 based on the above-described measured value and adjusts the height of the gripper distance adjustment auxiliary cam 41 so that the distance between the grippers 2 and 3 is $X_0 + \alpha + (W_0 - W)$ as indicated by the solid lines in Fig. 10. Fig. 9 shows the gripper distance adjustment auxiliary cam 41 after this height adjustment is completed.

**[0068]** In this manner, in the first sealing process at position G, the roller 36 rides on the gripper distance adjustment auxiliary cam 41 from the gripper distance setting cam 28, and the distance between the grippers 2 and 3 is adjusted so as to be the above-described appropriate value.

**[0069]** In the second embodiment described above, the camera 38 detects the apparent bag width W of the bag 9 before this bag is suction-held by the bag-feeding suction device 37 of the bag feeder 1 1 and supplied to and gripped by the pair of grippers 2 and 3. However, this detection by the camera can be done after the bag is supplied to and gripped by the pair of grippers 2 and 3. Such detection can also be done, furthermore, immediately after the pair of grippers 2 and 3 stop at position B (prior to when the gripper distance setting cam 28 and the gripper distance adjustment auxiliary cam 41 make the backward rotations and the distance between the grippers 2 and 3 widens).

**[0070]** The detection means is not limited to a camera, and a laser sensor or the like, for example, can be used instead.

**[0071]** In the second embodiment described above, moreover, the gripper distance adjustment auxiliary cam 41 is used for adjusting the distance between the grippers 2 and 3 in the first sealing process. However, the gripper distance adjustment auxiliary cam 41 can also be used for other processes where it is preferable to apply tensions to the bag mouth uniformly and sufficiently, such other processes, for example, being a steam blowing process, a second sealing process, and a cool sealing process; and it can also be used, respectively, to two or more processes, such as a first sealing process and a second sealing process, for example.

## Claims

**1.** A bag filling and packaging method, wherein:

with a plurality of gripper pairs, each for gripping left and right side edges of a bag, being provided at equal distance about a carrying member that rotates along a circular path,
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

said method comprising the steps of:

measuring an apparent bag width of each one of the bags prior to gripping the bag with said gripper pair; and
adjusting, according to an obtained measured value, a distance between grippers of said gripper pair when said gripper pair grips two side edges of a bag, so that an amount of part gripped by said gripper pair at side edges of a bag is constant for all of bags.

**2.** A bag filling and packaging method, wherein:

with a plurality of gripper pairs, each for gripping left and right side edges of a bag, being provided at equal distance about a carrying member that rotates along a circular path,
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

in said bag filling and packaging method:

a reference value, based on a nominal bag width value, being set for a distance between grippers of said gripper pair corresponding to each one of said packaging processes, and
a distance between grippers of said gripper pair, when said gripper pair grips two side edges of a bag in a bag supplying process, being adjustable to a size equal to or below said reference value; and

said method comprising the steps of:

measuring an apparent bag width of each one of the bags prior to gripping the bag with said gripper pair; and
adjusting, according to an obtained measured value, a distance between grippers of said gripper pair when said gripper pair grips two side edges of a bag, so that an amount of part gripped by said gripper pair at side edges of a bag is constant for all of bags.

**3.** A bag filling and packaging apparatus, wherein:

a plurality of gripper pairs, each for gripping left and right side edges of a bag, are provided at equal distance about a carrying member that rotates along a circular path, and
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

in said bag filling and packaging apparatus:

a reference value, based on a nominal bag width value, being set for a distance between grippers of said gripper pair corresponding to each one of said packaging processes, and
a distance between grippers of said gripper pair, when said gripper pair grips two side edges of a bag in a bag supplying process, being adjustable to a size equal to or below said reference value; and

said bag filling and packaging apparatus comprising:

a bag width measurement means for measuring an apparent bag width of each one of the bags prior to gripping the bag with said gripper pair,
a gripper distance adjustment means for adjusting a distance of grippers of said gripper pair when said gripper pair grips two side edges of a bag; and
a control means for controlling said gripper distance adjustment means according to bag width measurement values and adjusting a distance between grippers to a value equal to or below the reference value, so that an amount of part gripped by said gripper pair at side edges of a bag is constant for all of bags.

**4.** The bag filling and packaging apparatus according to claim 3, wherein:

said carrying member is a revolving table;
a gripper distance setting cam for setting the distance between said grippers to a reference value is provided to surround a circumference of a table rotating shaft, an upper surface of said gripper distance setting cam making a cam surface;
said gripper distance adjustment means is comprised of

a gripper distance adjustment auxiliary cam having a cam surface on an upper surface

thereof, said gripper distance adjustment auxiliary cam being provided at predetermined positions in a circumferential direction of said gripper distance setting cam so as to be ascendable and descendable relative to said gripper distance setting cam, and
a drive mechanism for causing said gripper distance adjustment auxiliary cam to ascend and descend;

an urging means is provided in each one of said gripper pairs for urging grippers thereof so as to narrow a distance between said grippers; and
a transmission mechanism is provided in said table for each one of said gripper pairs, said transmission mechanism comprising a roller that rolls along cam surfaces of said two cams for, against an urging force of said urging means, transmitting displacement of said roller to said gripper pair, thus opening said grippers of said gripper pair to a distance that corresponds to heights of said cam surfaces.

**5.** A bag filling and packaging method, wherein:

with a plurality of gripper pairs, each for gripping left and right side edges of a bag, being provided at equal distance about a carrying member that rotates along a circular path,
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

said method comprising the steps of:

measuring an apparent bag width of each one of the bags and
adjusting said distance between said grippers, according to a measured value of the apparent bag width, when, in one or more processes after a bag supplying process, said distance between said grippers is widened greater than a distance between grippers in said bag supplying process so that a degree of bag tension in said one or more processes after said bag supplying process is constant for all of bags.

**6.** A bag filling and packaging method, wherein:

with a plurality of gripper pairs, each for gripping left and right side edges of a bag, being provided at equal distance about a carrying member that rotates along a circular path,
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

in said bag tilling and packaging method:

a reference value, based on a nominal bag width value, being set for a distance between grippers corresponding to each one of said packaging processes; and
a distance between grippers of said gripper pair in one or more processes, for which a reference value greater than a reference value in a bag supplying process is set, being able to be set to be a size equal to or greater than a reference value in said one or more processes; and

said method comprising the steps of:

measuring an apparent bag width of each one of the bags and
adjusting a distance between grippers of said gripper pair, according to a measured value of the apparent bag width in said one or more processes after said bag supplying process, to a size equal to or greater than a reference value in said one or more processes, so that a degree of bag tension in said one or more processes after said bag supplying process is constant for all of bags.

**7.** A bag filling and packaging apparatus, wherein:

a plurality of gripper pairs, each for gripping left and right side edges of a bag, are provided at equal distance about a carrying member that rotates along a circular path, and
bags are supplied to each gripper pair so that, while said carrying member makes one revolution, a bag gripped by said gripper pair is subjected sequentially to packaging processes including bag mouth opening, contents charging, and bag mouth sealing;

in said bag filling and packaging apparatus:

a reference value, based on a nominal bag width value, being set for a distance between grippers corresponding to each one of said packaging processes, and
a distance between grippers of said gripper pair in one or more processes, for which a reference value greater than a reference value in a bag supplying process is set, being able to be set to be a size equal to or greater than a reference value in said one or more processes; and

said bag filling and packaging apparatus comprising:

a bag width measurement means for measuring an apparent bag width of each one of the bags;
a gripper distance adjustment means for adjusting said distance between said grippers in said one or more processes after said bag supplying process; and
a control means for controlling said gripper distance adjustment means according to a bag width measurement value and for adjusting said distance between grippers in said one or more processes after said bag supplying process to a value that is greater than said reference value by a difference between said nominal value and said measured value.

**8.** The bag filling and packaging apparatus according to claim 7, wherein:

said carrying member is a revolving table;
a gripper distance setting cam for setting the distance between said grippers to a reference value is provided to surround a circumference of a table rotating shaft, an upper surface of said gripper distance setting cam being a cam surface;
said gripper distance adjustment means is comprised of

a gripper distance adjustment auxiliary cam having a cam surface on an upper surface thereof, said gripper distance adjustment auxiliary cam being provided at predetermined positions in a circumferential direction of said gripper distance setting cam so as to be ascendable and descendable relative to said gripper distance setting cam, and
a drive mechanism for causing said gripper distance adjustment auxiliary cam to ascend and descend;

an urging means is provided in each one of said gripper pairs for urging grippers thereof so as to narrow a distance between said grippers; and
a transmission mechanism is provided in said table for each one of said gripper pairs, said transmission mechanism comprising a roller that rolls along cam surfaces of said two cams for, against an urging force of said urging means, transmitting displacement of said roller to said gripper pair, thus opening said grippers of said gripper pair to a distance that corresponds to heights of said cam surfaces.

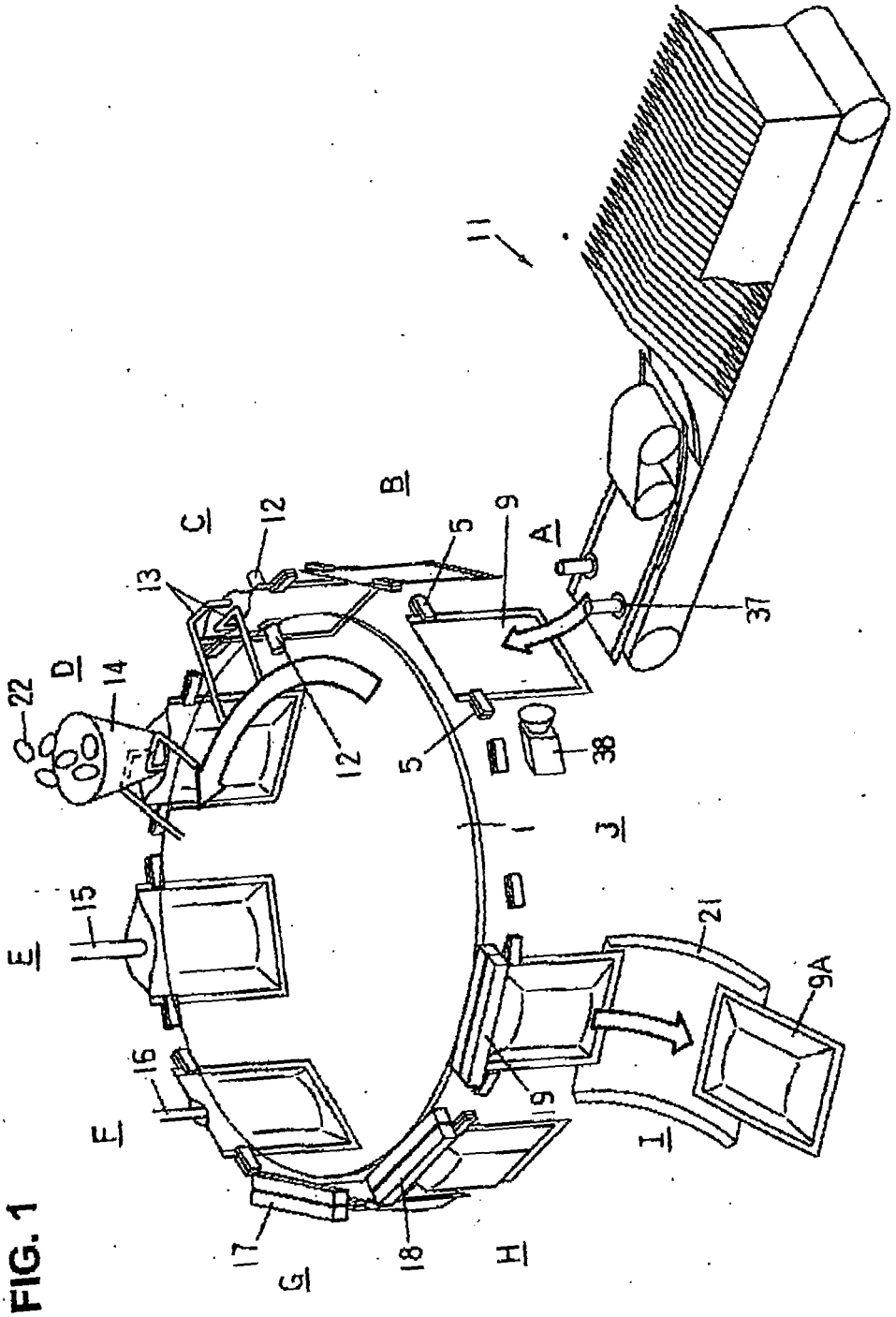



FIG. 1

FIG. 2

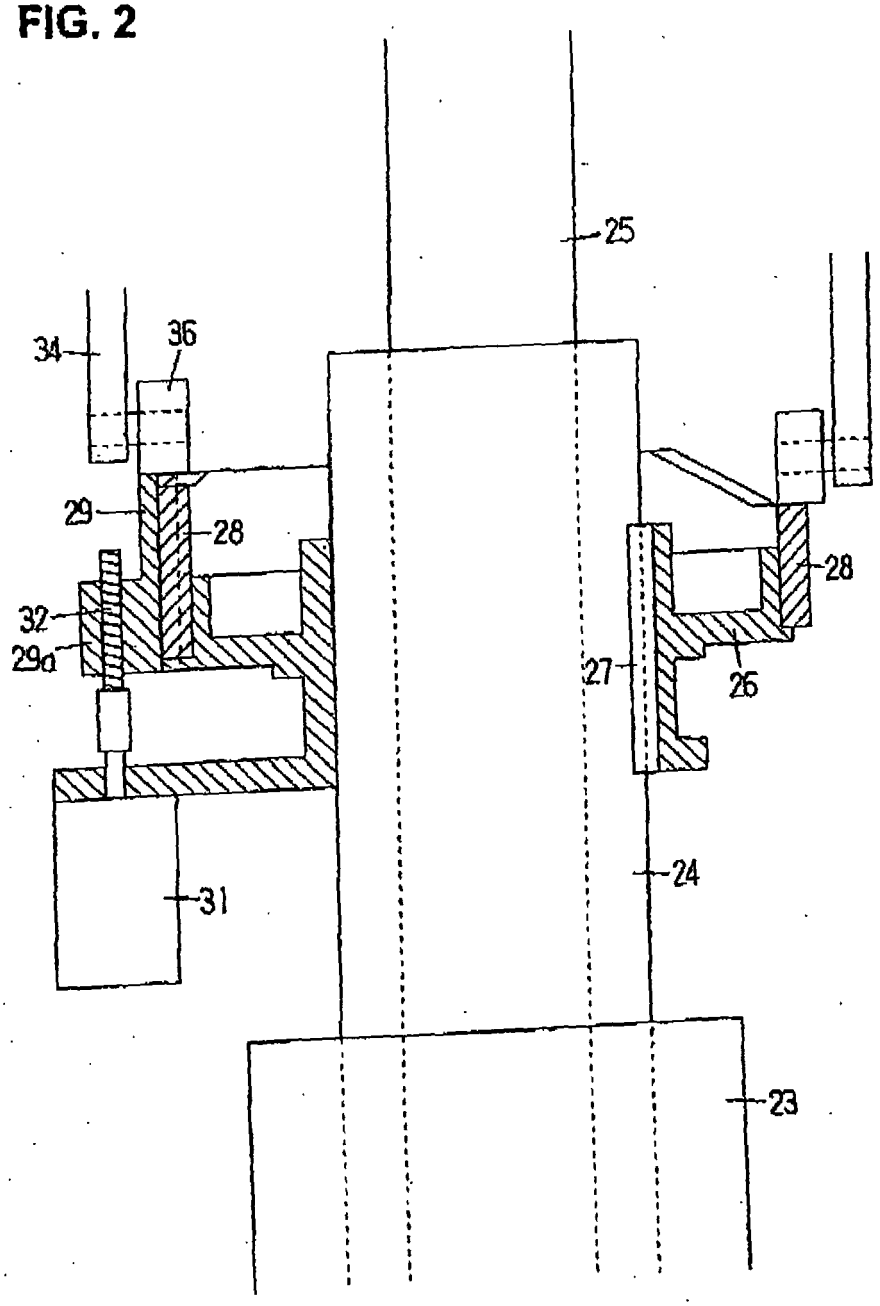


FIG. 3

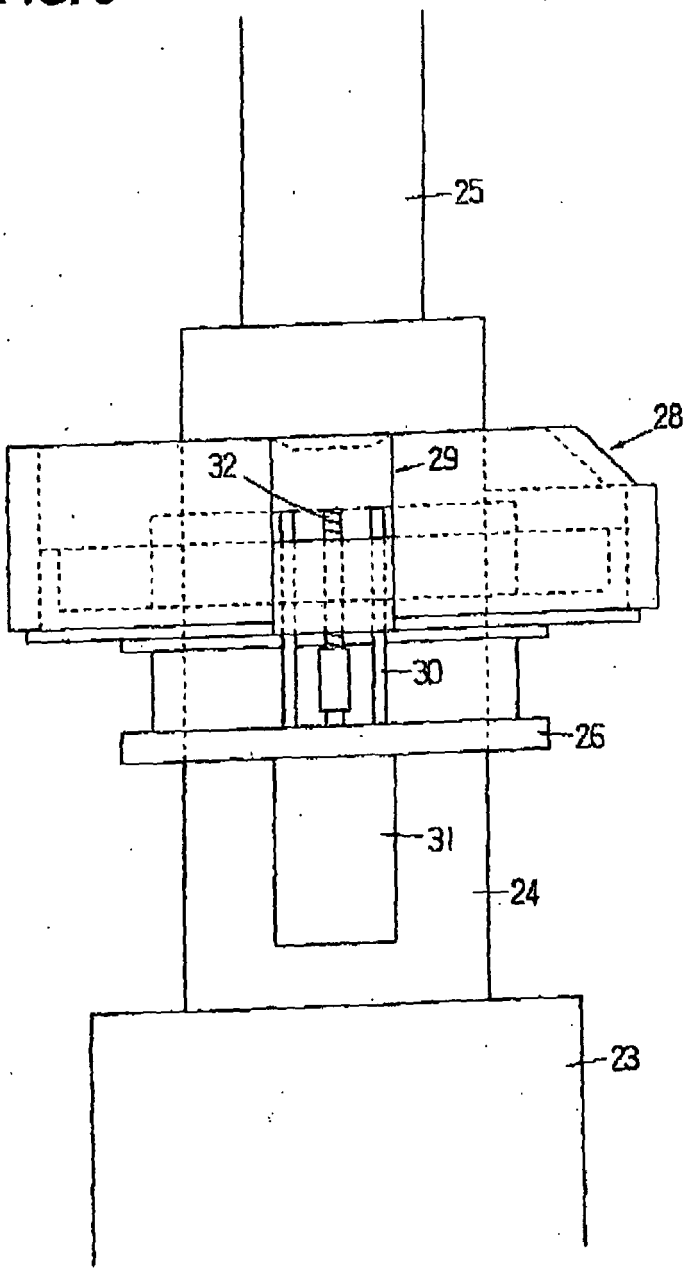
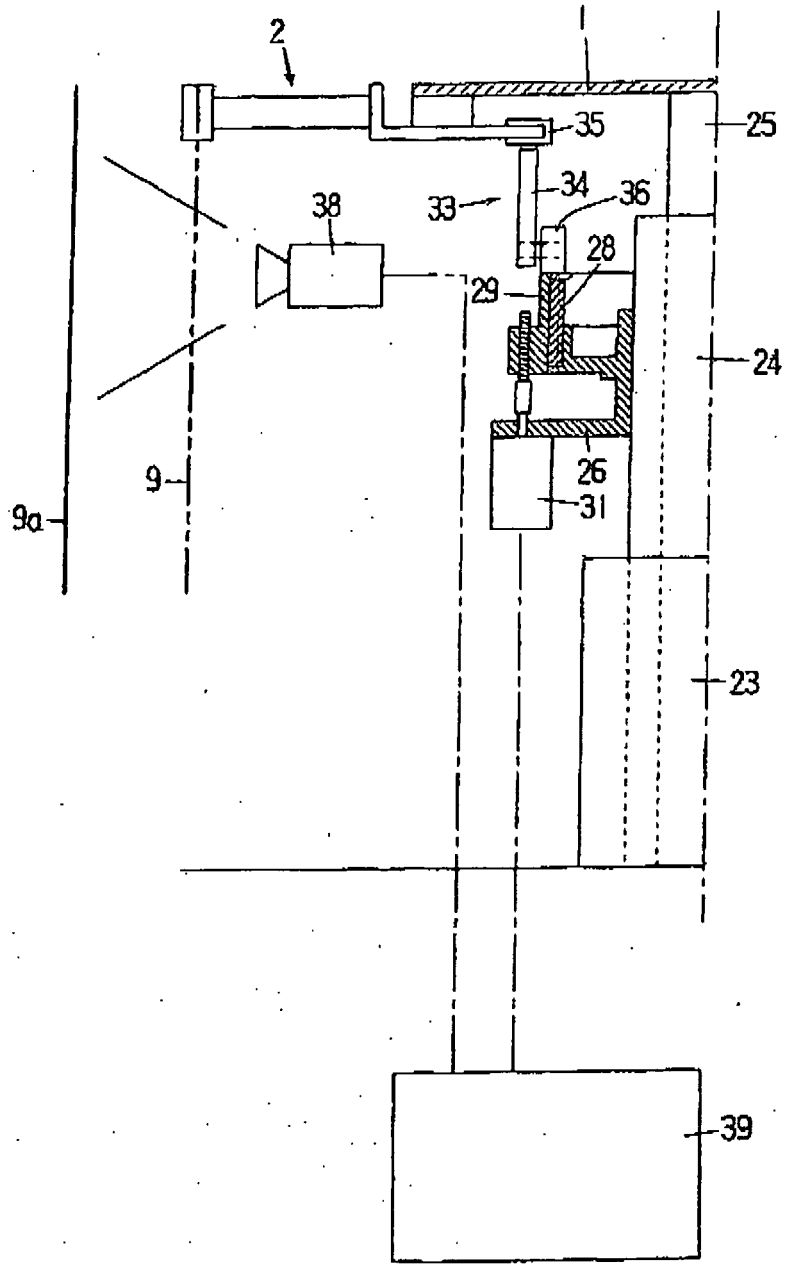


FIG. 4



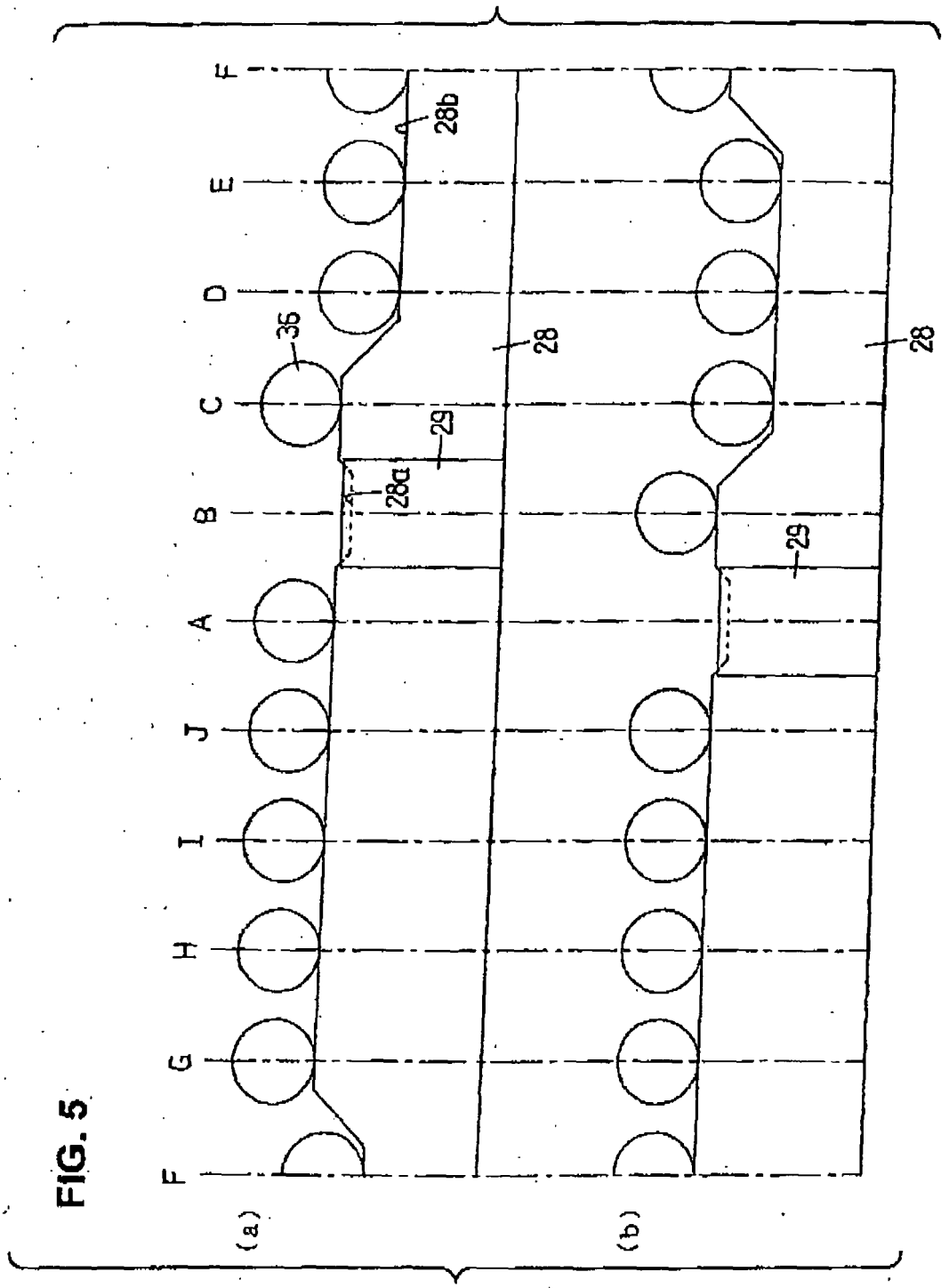



FIG. 5

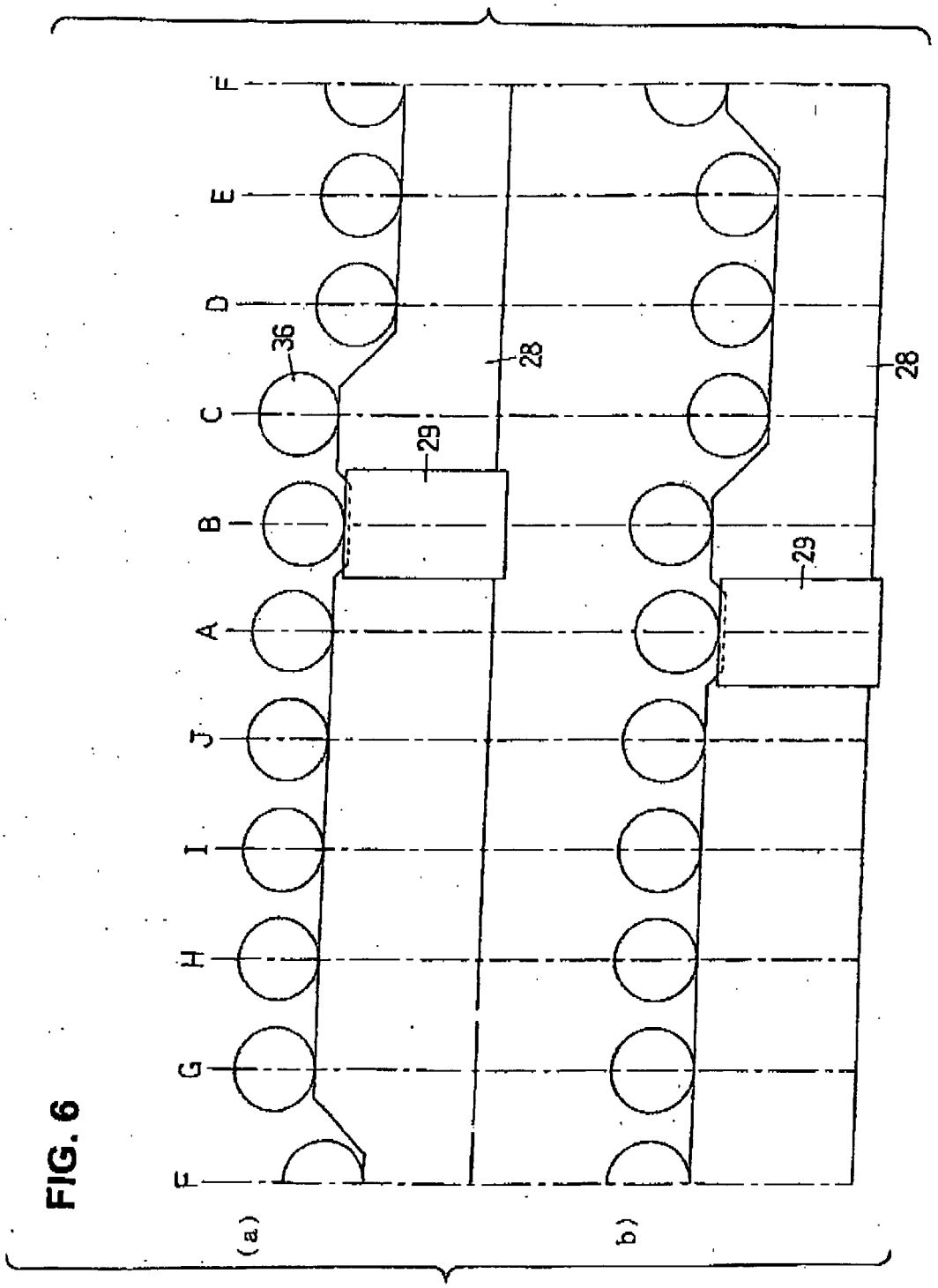
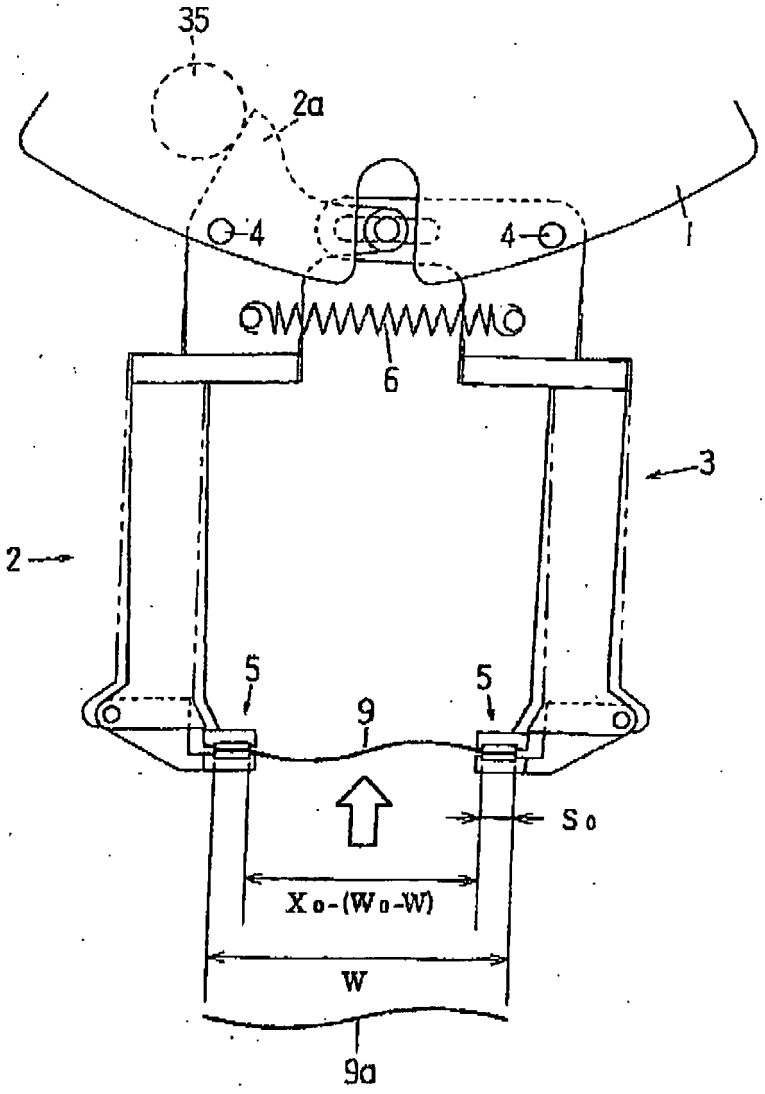



FIG. 6

FIG. 7



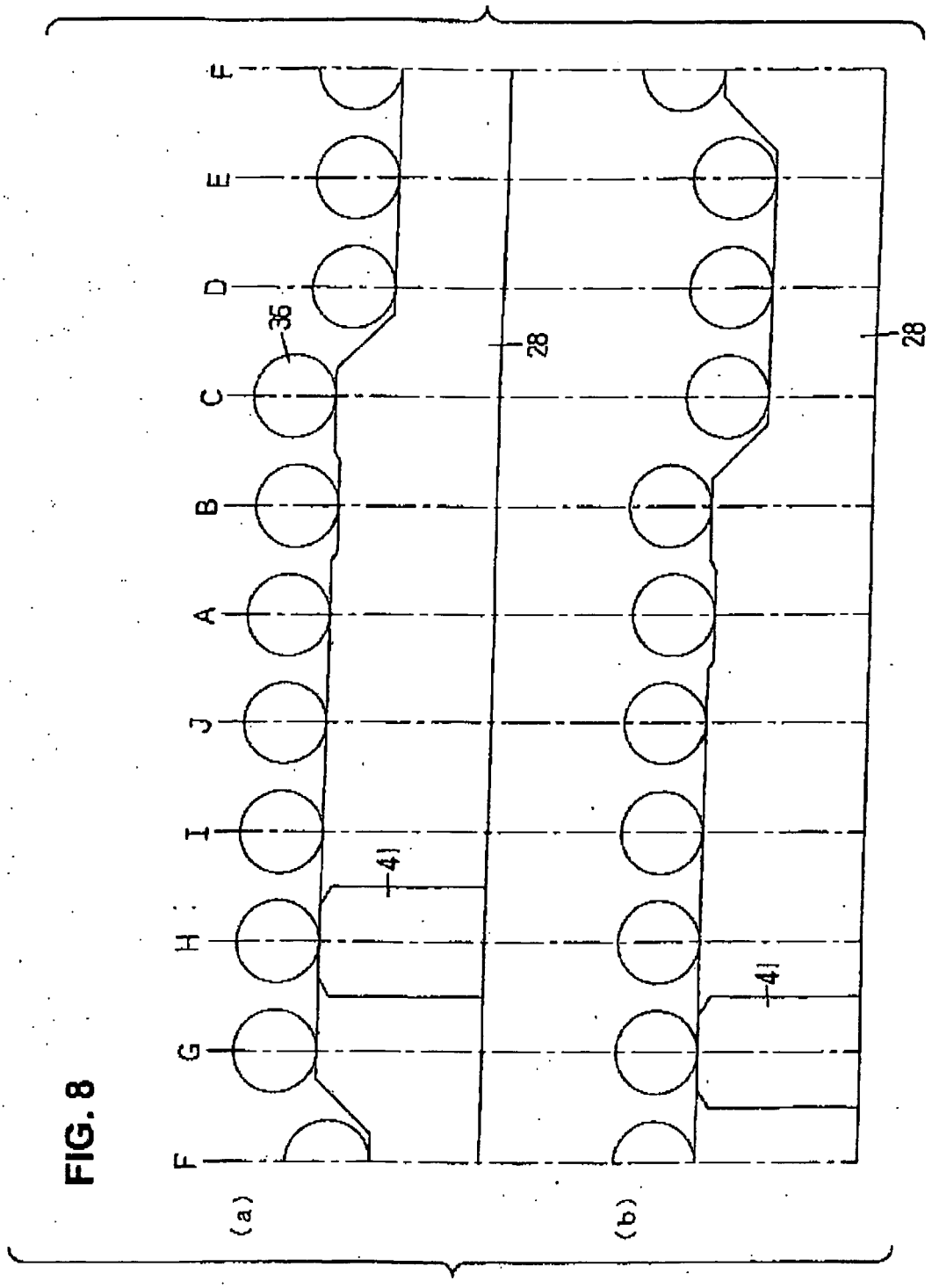



FIG. 8

FIG. 9

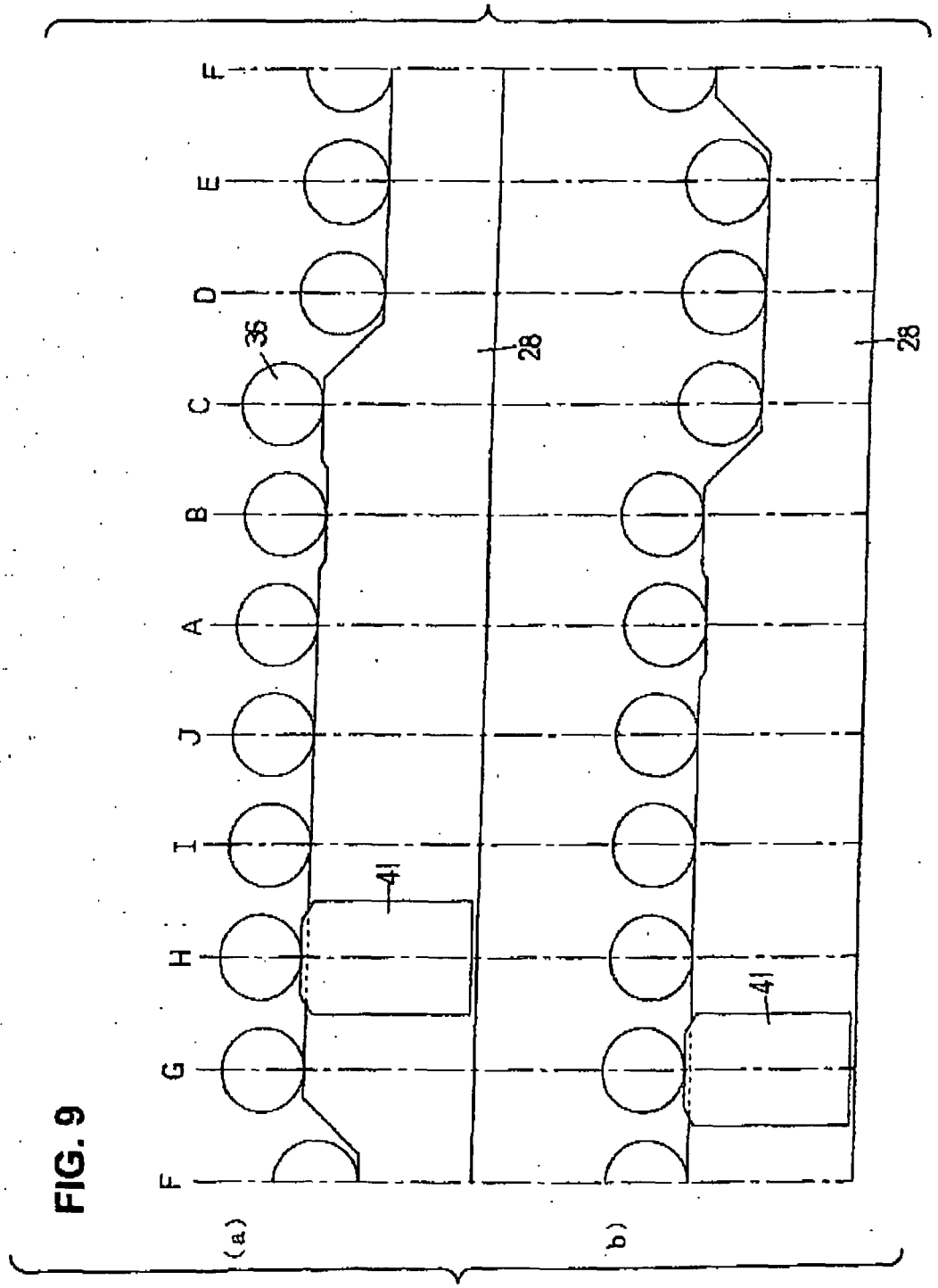


FIG. 10

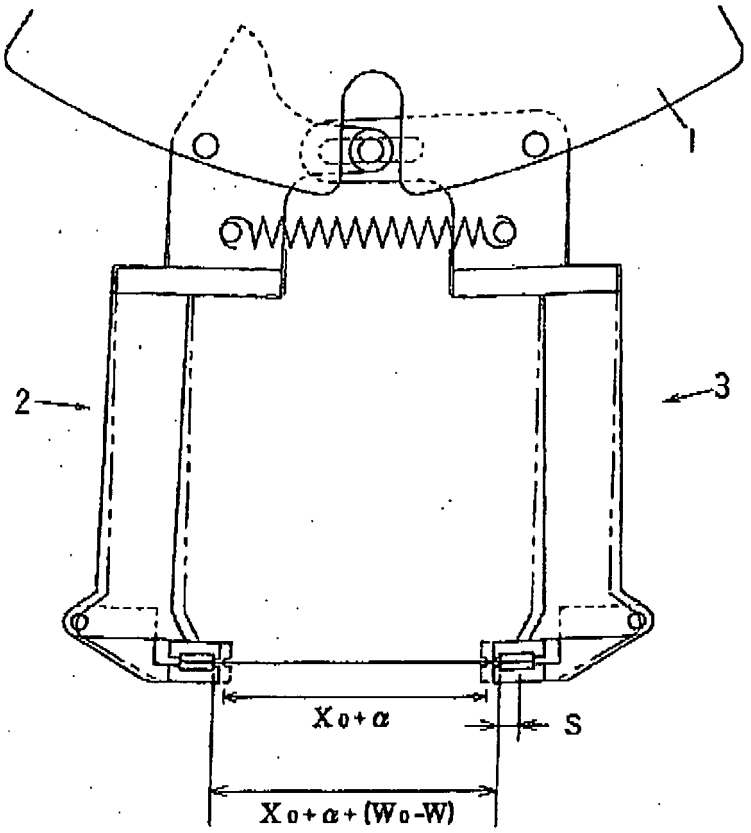


**FIG. 11**
RELATED ART

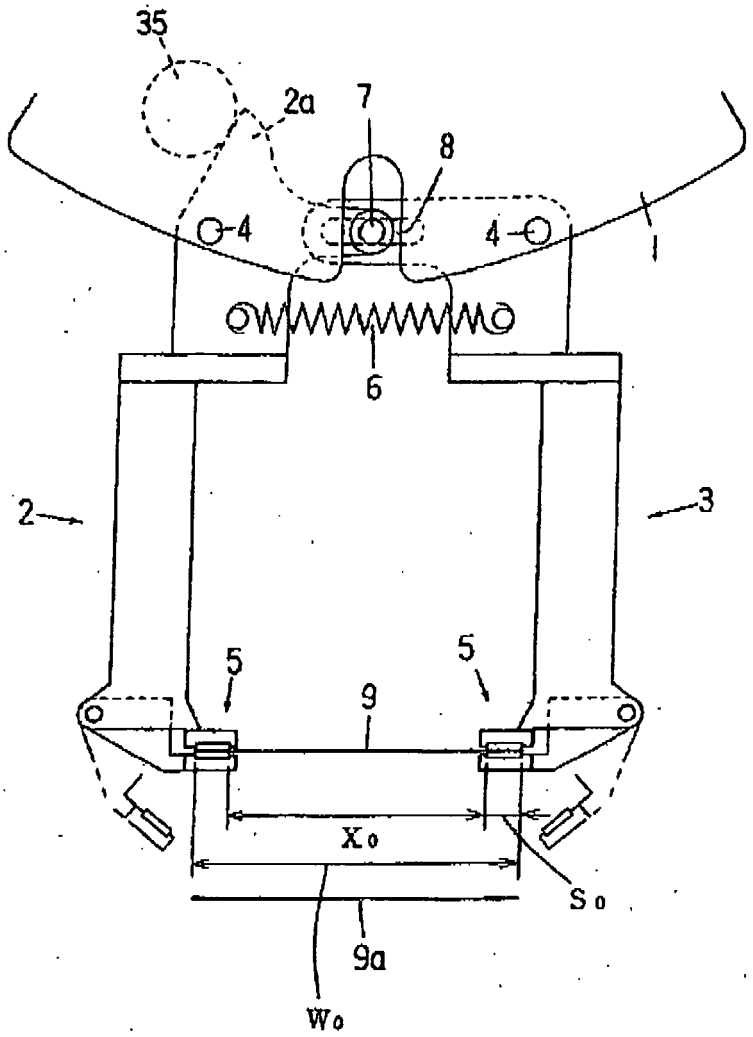
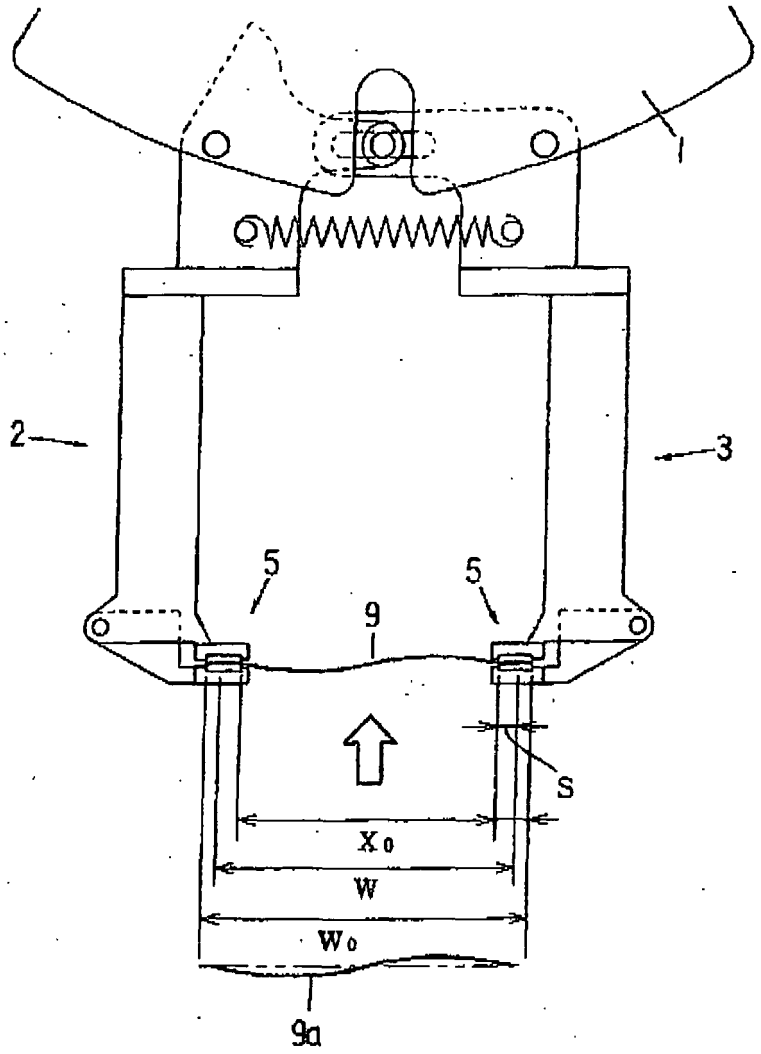


**FIG. 12**
**RELATED ART**



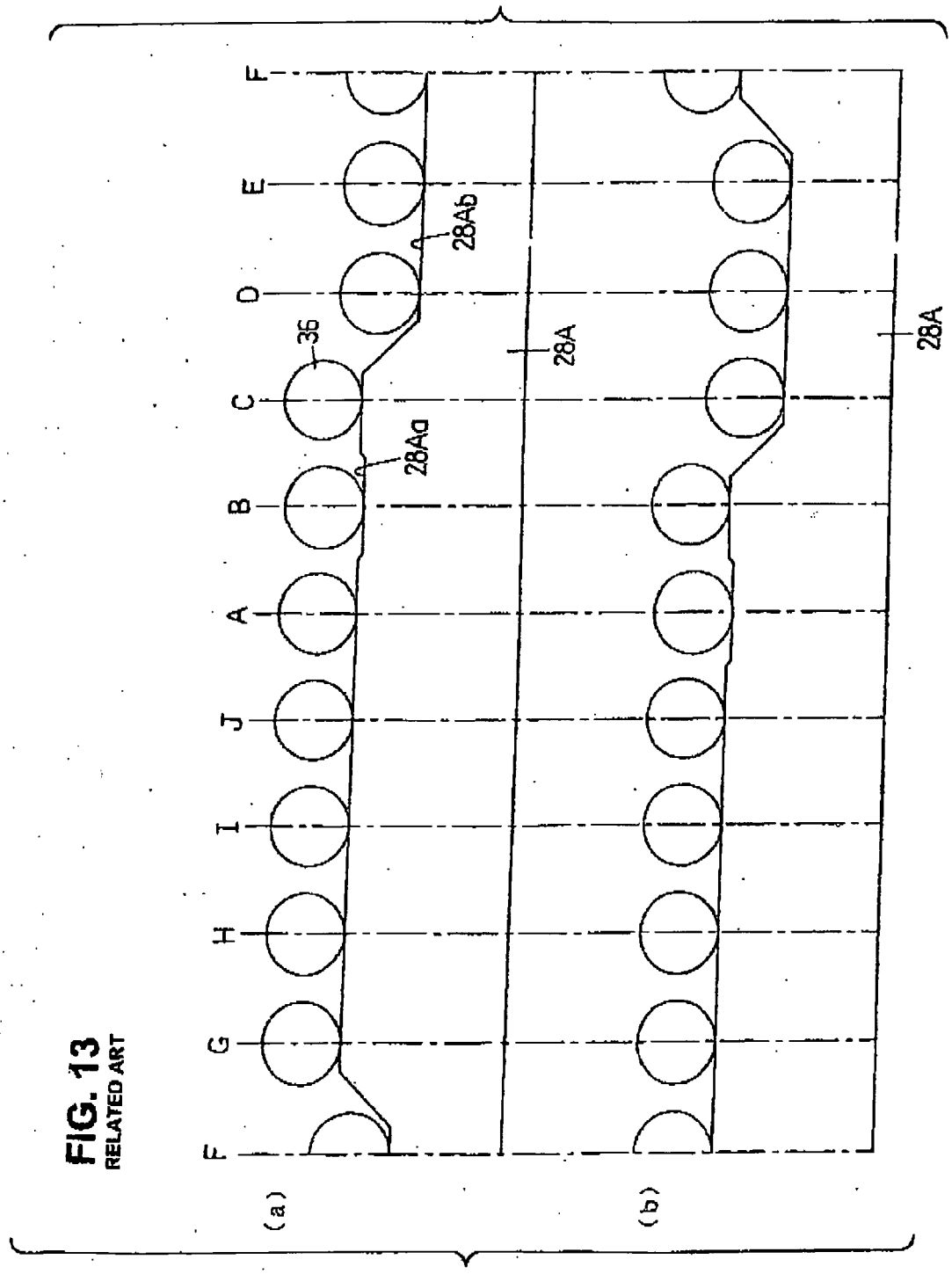



FIG. 13
RELATED ART

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 07 00 4560

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | EP 0 999 137 A (KLOCKNER BARTELT INC [US]) 10 May 2000 (2000-05-10) * paragraphs [0050] - [0053]; figures 1,3,4a * | 1-8 | INV. B65B43/46 B65B59/00 |
| D,A | JP 09 095318 A (TOYO JIDOKI KK) 8 April 1997 (1997-04-08) * abstract; figures * | 1-8 | |
| A | EP 0 908 386 A1 (INDAG GMBH [DE]) 14 April 1999 (1999-04-14) * paragraphs [0005] - [0007], [0018], [0021], [0025], [0028] - [0035]; figures * | 1-8 | |
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| A | US 4 912 907 A (FANG JIN-LIOU [US] ET AL) 16 March 1988 (1988-03-16) * column 3, lines 21-62 * * column 4, paragraph 35-59 * | 1-8 | TECHNICAL FIELDS SEARCHED (IPC) B65B |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 11 April 2007 | Philippon, Daniel |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 00 4560

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
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11-04-2007

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