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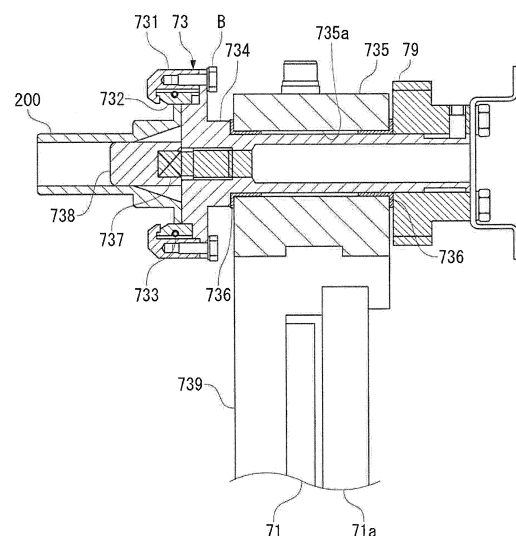
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(54) **RESIN BAG PRODUCTION EQUIPMENT**

(57) Resin bag manufacturing equipment is provided that is capable of accurately inserting a port into a necessary position in an opening of a bag body even if moving means of a belt driven type with an inferior positioning accuracy is used. Resin bag manufacturing equipment 10 of the present invention includes a body fabricating unit 20 fabricating a bag body 100, a port attaching unit 40 attaching a port 200 to the bag body 100 by welding, and a filling unit 50 filling the bag with a content. The port attaching unit 40 includes a port holder 73 holding the port 200 when the port 200 is inserted into an opening 101 of the bag body 100. This port holder 73 includes a hold ring 732 configured of a combination of a plurality of segments 732a to 732d, and a spiral spring 733 applying an elastic force oriented to diameter reduction to the hold ring 732.

FIG. 8



Description

Technical Field

5 [0001] The present invention relates to an equipment for manufacturing a resin bag used as a container for a fluid such as a drip-feed solution.

Background Art

10 [0002] Resin bags are used as containers for a liquid such as a drip-feed solution. Such a resin bag is formed of a soft resin film or the like and made up of a bag-shaped bag body having an opening at one side and a tubular port attached to the opening. The tubular port is made of hard resin and serves as a mouth through which a liquid is poured from or into the bag body.

15 [0003] Conventionally, such a resin bag is made by setting a port between two ribbon-shaped films, welding these two films and at the same time welding the films and port in the opening with the port interposed between the two films (for example, see Patent Document 1). However, in this manufacturing method, wrinkles were produced over the films around the welded part between the films and the port, thereby degrading the appearance. Also, the films are drawn and therefore cannot be securely welded, resulting in insufficient sealing strength and, in addition, causing a gap between the films and the port. Therefore, the inventors have suggested in Patent Document 2 that the port is welded to the bag
20 body with its entire perimeter other than the opening being welded.

Citation List

Patent Documents

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[0004]

Patent Document 1: International Publication No. 2006/042710

Patent Document 2: International Publication No. 2010/023753

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Summary of the Invention

Technical Problems to be Solved by the Invention

35 [0005] Resin bag manufacturing equipment includes a port holder holding a port when the port is inserted into a bag body and the port is welded. In the resin bag equipment disclosed in Patent Document 2, the port holder is supported with an endless belt so that the port holder can move.

[0006] Compared with a rotary table, a belt driven type can increase the number of port holders supportable per unit area. Also, the belt driven type is excellent in handling ease because the port holder can be linearly moved. However,
40 the belt driven type is inferior in positioning accuracy in stopping the port holder at a predetermined position. The problem of low positioning accuracy is based on that the driving belt is made of resin. And, if the port holder does not stop at an accurate position, the port cannot be inserted into a predetermined position of an opening (hereinafter, a body opening) of the bag body, inviting poor welding of the port and being prone to produce pin holes at a welded part. Such a resin bag is handled as a defective product.

45 [0007] The present invention was made in view of these technological problems, and has an object of providing resin bag manufacturing equipment capable of accurately inserting a port into a necessary position of an opening of a bag body even if a belt driven type moving means with an inferior positioning accuracy is used.

Solution to the Problems

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[0008] To weld a port, the port held by a port holder is interposed between paired upper and lower molds, which are heating means, via a resin film forming a bag body. The molds each have a recessed part corresponding to the outer shape of the port. At the time of welding, the port is interposed between these recessed parts. However, when the port is inserted into a position shifted from the body opening, the port cannot be interposed between the recessed parts of
55 the molds when the port is welded, resulting in the occurrence of poor welding of the port.

[0009] Since the belt driven type is inferior in positioning accuracy, it is not easy to accurately insert the port held by the port holder into the predetermined position of the body opening. Thus, presuming the inferior positioning accuracy, the inventors have conceived that a port holder is provided with a structure in which a portion holding the port is movable

by following a force to be applied. With this, even if the port is inserted into a shifted position of the body opening, when the port receives a force from the molds when being interposed between the molds, the port can move to an appropriate position of the recessed parts of the molds together with the port holder holding the port.

[0010] Resin bag manufacturing equipment of the present invention includes a body fabricating unit fabricating a bag body, a port attaching unit attaching, by welding, a port to the bag body fabricated by the bag body fabricating unit, and a filling unit filling the bag body having the port attached thereto by the port attaching unit with a content.

[0011] In the resin bag manufacturing equipment of the present invention, the port attaching unit includes a port holder holding the port when the port is inserted into an opening of the bag body. This port holder includes a ring-shaped holding body configured of a combination of a plurality of segments and directly holding the port, and an elastic body providing the ring-shaped holding body with an elastic force oriented to diameter reduction.

[0012] In the port holder according to the present invention, the ring-shaped holding body provided with an elastic force oriented to diameter reduction holds the port. For this reason, if a force larger than the elastic force is applied to the port, the port can be displaced against the elastic force applied to the ring-shaped holding body. Therefore, even if the port is inserted into a shifted position of the opening of the bag body, the port makes contact with the molds to move along the recessed parts, thereby being positioned at an appropriate location in the recessed parts. As a result, the port can be welded to the bag body without inviting the occurrence of pin holes.

[0013] In the present invention, it is preferable that the ring-shaped holding body holding the port be rotatably provided.

[0014] It is useful in welding to the bag body later to preheat the port held by the ring-shaped holding body (a port holder) before the port is inserted into the bag body. This preheating can be performed by blowing heated air supplied from an air heater onto a necessary portion of the port, as will be described further below. Thus, to blow heated air onto the entire perimeter of the port, the ring-shaped holding body is rotatably provided.

[0015] When the port holder is preheated while being held by the port holder, as described above, the port (the ring-shaped holding body) is rotated and heated over the entire perimeter thereof so as to melt only the surface. A uniform depth of this melting is preferable to obtain a more uniform seal strength by welding the port to the bag body. To this end, the position of the port with respect to an air heater is required to be specified. However, with the port holder moved in the belt driven type, which is inferior in positioning accuracy, it can be also assumed that melting of the port by preheating may be nonuniform.

[0016] Thus, the port attaching unit of the present invention preferably includes a centering member. The centering member is movable between a first position away from the port held by the ring-shaped holding body and a second position where the centering member makes contact with the port and pushes the port in an axial direction. This centering member is driven to rotate according to rotation of the ring-shaped holding body when the centering member is at the second position.

[0017] The centering member placed at the second position presses the port, and thereby the port can be displaced against the elastic force applied to the ring-shaped holding body. Therefore, even if the port is held by the ring-shaped holding body at a shifted position with respect to the air heater, the port is moved to an appropriate position by following the centering member, thereby accurately adjusting the distance from the port to the air heater. As a result, the port can be uniformly molten by preheating.

[0018] When a transfer unit transferring the bag body fabricated by the body fabricating unit to the port attaching unit is further provided, the transfer unit preferably includes a positioning apparatus. This positioning apparatus includes a transfer direction guide engaging a tip part of the bag body in a transfer direction. Also, the positioning apparatus includes paired width direction guides that move closer to and away from each other in a direction orthogonal to the transfer direction of the bag body.

[0019] The bag body is positioned in the transfer direction by a transfer direction guide. Also, by bringing paired width direction guides closer to each other until these guides are in contact with the bag body, positioning in a direction orthogonal to the transfer direction is carried out. Thus positioned bag body is transported by transport means such as a robot to the port attaching unit.

[0020] Also, the transfer unit preferably includes an accumulating apparatus accumulating the bag body without transporting the bag body to the port attaching unit when an anomaly occurs in either one or both of the port attaching unit and the filling unit that execute a downstream process.

[0021] When the downstream process stops, it can be thought that the body fabricating unit stops accordingly. However, at the time of starting the body fabricating unit, a defective product occurs. Therefore, to avoid the body fabricating unit from stopping as much as possible, the body fabricating unit continues the operation, instead, the fabricated bag bodies are accumulated before they are transported to the port attaching unit.

Advantageous Effects of Invention

[0022] According to the present invention, the holder comprises the structure in which a portion holding the port is movable by following a force to be applied. Thus, when the port receives a force from the molds when being interposed

between the molds, the port can move to an appropriate position of the recessed parts of the molds together with the port holder holding the port even if the port is inserted into a shifted position of the body opening. Therefore, according to the resin bag manufacturing equipment of the present invention, the occurrence of poor welding typified by pin holes can be prevented even if the belt driven type moving means with an inferior positioning accuracy is used.

Brief Description of Drawings

[0023]

[FIG. 1] FIG. 1 is a plan view showing an arrangement of resin bag manufacturing equipment according to an embodiment of the present invention.

[FIG. 2] FIG. 2 is a plan view showing an arrangement of a port attaching unit of the resin bag manufacturing equipment.

[FIG. 3] FIG. 3 is a perspective view of an opening transport apparatus.

[FIGS. 4 and 4B] FIGS. 4A and 4B are drawings that show a series of processes for opening the bag body in the opening transport apparatus, FIG. 4A shows the state in which the bag body is positioned between plate members and FIG. 4B shows the state in which the bag body is interposed between the plate members.

[FIGS. 5A and 5B] FIGS. 5A and 5B are drawings that show processes continued from FIGS. 4A and 4B, FIG. 5A shows the state in which the bag body is retreated from a bag body transfer apparatus and FIG. 5B shows the state in which the bag body is moved to a port welding apparatus.

[FIGS. 6A and 6B] FIGS. 6A and 6B are drawings that show processes continued from FIGS. 5A and 5B, FIG. 6A shows the state in which the plate members are brought closer to each other to open an opening and FIG. 6B shows the state in which the bag body is brought closer to a port.

[FIG. 7] FIG. 7 is a front view of a port holder.

[FIG. 8] FIG. 8 is a sectional view of an 8a-8a arrowed portion of the port holder in FIG. 7.

[FIGS. 9A and 9B] FIG. 9A shows a hold ring forming the port holder and FIG. 9B is a partially enlarged sectional view of FIG. 8

[FIG. 10] FIG. 10 is a perspective view of a port preheating apparatus.

[FIG. 11] FIG. 11 is a side view of a port aligning apparatus.

[FIGS. 12A and 12B] FIGS. 12A and 12B are drawings continued from FIGS. 6A and 6B, FIG. 12A shows the state in which the port is inserted into the opening of the bag body and FIG. 12B shows the state of welding the opening having the port inserted therein.

[FIGS. 13A and 13B] FIGS. 13A and 13B are drawings continued from FIGS. 12A and 12B, FIG. 13A shows the state in which clamping of the bag body by the plate members is released and FIG. 13B shows the state in which a port seal mold is removed from the bag body.

[FIG. 14] FIG. 14 is a plan view of a positioning apparatus.

[FIGS. 15A and 15B] FIGS. 15A and 15B show an accumulating apparatus, FIG. 15A being a plan view and FIG. 15B being a side view.

Description of Embodiments

[0024] The present invention is described in detail below based on an embodiment shown in the attached drawings.

[0025] Resin bag manufacturing equipment 10 in the present embodiment includes a body fabricating unit 20 fabricating a bag body 100 (refer to FIG. 3), a transfer unit 30 transferring the bag fabricated by the body fabricating unit 20 toward the next process, a port attaching unit 40 attaching, by welding, a port 200 to the bag body 100 supplied from the transfer unit 30, and a filling unit 50 filling the bag body 100 having the port 200 attached thereto by the port attaching unit 40 with a content.

<Body Fabricating Unit 20>

[0026] The body fabricating unit 20 is a portion fabricating the bag body 100 before the port 200 is attached. The body fabricating unit 20 fabricates the bag body 100 by welding and cutting a resin film drawn from a raw film material roll. The bag body 100 has three welded sides, but an opening 101, into which the port 200 is inserted, is not welded. As a specific method of fabricating the bag body 100, for example, the method disclosed in Patent Document 2 can be applied, and another method can also be applied. Furthermore, various modes can be applied to the bag body 100. For example, the bag body 100 is not restricted to the one having one room for accommodating the content, and the bag body 100 can have a room for accommodating the content sectioned into two.

<Transfer unit 30>

[0027] The transfer unit 30 includes a bag transfer conveyor 31 transferring the bag body 100 supplied from the body fabricating unit 20 toward the port attaching unit 40, a positioning apparatus 32 positioning the bag body 100 supplied from the bag transfer conveyor 31, and a transport robot 33 transporting the bag body 100 supplied from the bag transfer conveyor 31 to the positioning apparatus 32. The transfer unit 30 also includes an accumulating apparatus 34 accumulating the bag body 100 without transporting the bag body 100 to the port attaching unit 40.

[0028] The bag bodies 100 are transferred, for example, while being arranged in a line on the bag transfer conveyor 31. When transferred to a predetermined position on the bag transfer conveyor 31, the bag body 100 is transported by the transport robot 33 to the positioning apparatus 32.

[0029] The positioning apparatus 32 positions the transported bag body 100 in two directions, that is, a transfer direction and a direction orthogonal to the transfer direction (a width direction).

[0030] As shown in FIG. 14, the positioning apparatus 32 includes transfer conveyors 321, 321 arranged in two lines. The transfer conveyors 321, 321 each transfer the bag body 100. The transfer conveyors 321, 321 spread over a driving roll 323 driven by a motor 322 and a driven roll 324 placed a predetermined space away from the driving roll 323. With the motor 322 driven for rotation, the transfer conveyors 321, 321 run to transfer the bag body 100 (not shown) placed thereon to the right side in the drawing (in a transfer direction).

[0031] The positioning apparatus 32 includes a transfer direction positioning guide 325 at an end in the transfer direction. The bag body 100 transferred over the transfer conveyors 321, 321 abuts on the transfer direction positioning guide 325, thereby being positioned in the transfer direction.

[0032] The positioning apparatus 32 also includes first width direction positioning guides 326, 326 on the left side of the transfer conveyors 321, 321 with respect to the transfer direction, respectively, and second width direction positioning guides 329, 329 on the right side of the transfer conveyors 321, 321 with respect to the transfer direction, respectively. The first width direction positioning guides 326, 326 are connected to each other with a link member 327, and the second width direction positioning guides 329, 329 are connected to each other with a link member 330. The positioning apparatus 32 includes an air cylinder 328 driving the first width direction positioning guides 326, 326 and an air cylinder 331 driving the second width direction positioning guides 329, 329.

[0033] The air cylinder 328 and the air cylinder 331 are simultaneously driven to bring the first width direction positioning guides 326, 326 and the second width direction positioning guides 329, 329 having the transfer conveyors 321, 321 interposed therebetween closer to each other until these guides are in contact with the bag body 100. Thus, the bag body 100 transferred over the transfer conveyors 321, 321 is positioned in the width direction. With the bag body 100 being positioned, the air cylinder 328 and the air cylinder 331 are simultaneously driven to separate the first width direction positioning guides 326, 326 and the second width direction positioning guides 329, 329 away from each other.

[0034] As such, even if the position of the bag body 100 is varied at the time of being supplied from the bag transfer conveyor 31, the bag body 100 is accurately positioned in both of the transfer direction and the width direction, and then is transported to the port attaching unit 40 performing the next process. In this manner, the bag body 100 can be transported to the port attaching unit 40 as being in a posture required for attachment of the port 200, and therefore welding of the port 200 can be appropriately performed.

[0035] Also, since the positioning apparatus 32 does not catch the bag body 100 in the course of positioning, positioning can be stably performed even if undulations are present on the bag body 100.

[0036] Transfer of the bag body 100 from the positioning apparatus 32 to the port attaching unit 40 can be performed by using a transport apparatus that includes a suction cup that suctions the bag body 100 or a clasper that clamps the bag body 100 and also can ascend and descend and turn around. The bag body 100 positioned by the positioning apparatus 32 is passed to an opening transport apparatus 60 of the port attaching unit 40.

[0037] While the attachment of the port 200 to the bag body 100 in the port attaching unit 40 and the filling of the bag (the bag body 100) with the content in the filling unit 50 are being smoothly performed, the bag body 100 is transported by the transport robot 33 to the positioning apparatus 32, and then is supplied to the port attaching unit 40. However, when an anomaly occurs in either one or both of the bag attaching unit 40 and the filling unit 50 (the downstream process), the operation may be stopped. In this case, while the body fabricating unit 20 continues fabrication of the bag body 100, the fabricated bag body 100 is not transported to the positioning apparatus 32 but is accumulated in the accumulating apparatus 34.

[0038] The body fabricating unit 20 is desirably able to fabricate a good product from the time immediately after the start. However, to fabricate a good product, it takes time to adjust the apparatus, and the bag bodies 100 fabricated before the adjustment is completed are defective products. Therefore, it is preferable to avoid the body fabricating unit 20 from stopping as much as possible. That is why the fabricated bag bodies 100 are accumulated even if the bag attaching unit 40 or the filling unit 50 stops.

[0039] An example of the accumulating apparatus 34 is shown in FIG. 15

[0040] The accumulating apparatus 34 includes two bag accumulating containers 342 on a table 341. The bag accu-

mulating containers 342 are box-shaped members each with its upper part open, and accumulate the bag bodies 100 transported from the transport robot 33. In each of the bag accumulating containers 342, an ascending and descending table 343 is provided. The ascending and descending table 343 on which the bag bodies 100 are placed descends as the number of accumulated bag bodies 100 is increased, thereby increasing the number of bag bodies 100 that can be accumulated in the bag accumulating container 342. The descending of the ascending and descending table 343 can be controlled by detecting the bag bodies 100 with a sensor provided to an upper part of the bag accumulating container 342.

[0041] The mode of operating the bag accumulating container 342 can be any, but can be as follows, for example.

[0042] When the downstream process stops due to an anomaly, the transport robot 33 transports the bag body 100 supplied from the transfer unit 30 to the accumulating apparatus 34 without transporting the bag body 100 to the positioning apparatus 32. When the downstream process recovers, the transport robot 33 stops transporting the bag body 100 supplied from the transfer unit 30 to the accumulating apparatus 34 and transports the bag body 100 to the positioning apparatus 32.

[0043] When, for example, the content of the filling unit 50 is decreased to a predetermined value, the bag bodies 100 accumulated in the accumulating apparatus 34 are transported (dispensed) to the port attaching unit 40 for welding to the port 200.

[0044] The bag bodies 100 accumulated by the bag accumulating containers 342 is positioned, and therefore welding of the port 200 can be appropriately performed also on the bag body 100 dispensed from the accumulating apparatus 34. When the bag bodies 100 are dispensed from the accumulating apparatus 34, the fabrication of the bag bodies 100 in the body fabricating unit 20 is stopped.

<Port Attaching Unit 40>

[0045] As shown in FIG. 2, the port attaching unit 40 includes the opening transport apparatus 60, a port transfer apparatus 70, a port welding apparatus 80, and a port aligning apparatus 90.

[0046] The opening transport apparatus 60 holds the bag body 100 positioned by the positioning apparatus 32 of the transfer unit 30 when supplied, and opens the opening 101 of the bag body 100 before insertion of the port 200 and transfer to a seal position.

[0047] The bag body 100 held in the opening transport apparatus 60 and with the opening 101 being open, is transferred to the port welding apparatus 80 and is supplied with the port 200 by the port transfer apparatus 70.

[0048] The port welding apparatus 80 welds the port 200 inserted into the opening 101 of the bag body 100 in cooperation of the opening transport apparatus 60 and the port transfer apparatus 70, to the bag body 100.

[0049] The port aligning apparatus 90 prevents a core deviation of the port 200 when the port 200 is preheated.

[0050] As depicted in FIG. 3, the opening transport apparatus 60 has an upper frame 61A and a lower frame 61B arranged approximately in parallel to each other so that the frames are positioned above and below the bag body 100 supplied from the positioning apparatus 32. These upper frame 61A and the lower frame 61B are moved closer or away from each other in a vertical direction by a nip cylinder 62.

[0051] A lower surface at the tip of the upper frame 61A and an upper surface at the tip of the lower frame 61B are each provided with paired two plate members 63, 63, and a suction cup 64.

[0052] The upper and lower plate members 63, 63 are arranged so as to be pressed onto both sides of the opening 101 of the bag body 100. When the upper frame 61A and the lower frame 61B are brought closer to each other by the nip cylinder 62, the bag body 100 can be clamped by the upper and lower plate members 63 and 63 from both of front and back surfaces on both sides interposing the opening 101.

[0053] Also, the upper and lower plate members 63 and 63 are provided to arms 65, 65 rotating about the base ends 65a and 65a. With the arms 65, 65 being rotated in synchronization with each other by a driving mechanism 66 formed of an air cylinder 66a and a link mechanism 66b, the plate members 63, 63 move closer to and away from each other. That is, with the opening 101 of the bag body 100 being clamped, the arms 65, 65 are rotated in a direction in which the plate members 63 and 63 come closer to each other, thereby opening the opening 101.

[0054] Each suction cup 64 is arranged at an intermediate part between the paired two plate members 63, 63 so as to face a portion near a film end of the opening 101 of the bag body 100. The suction cups 64 positioned above and below are moved upward and downward each by an air cylinder 67. With the opening 101 of the bag body 100 being suctioned, the upper and lower suction cups 64 and 64 move away from each other, thereby opening the opening 101.

[0055] Also, an advancing and retreating cylinder 68 moves the upper frame 61A and the lower frame 61B described above in a direction orthogonal to the transfer direction oriented to the port welding apparatus 80.

[0056] Two sets of the above-configured upper frame 61A and lower frame 61B are equipped correspondingly to the process unit in the resin bag manufacturing equipment 10 being two bag bodies 100. These upper frame 61A and lower frame 61B are movable along a guide not shown between a position corresponding to the positioning apparatus 32 and a position corresponding to the port welding apparatus 80.

[0057] In this opening transport apparatus 60, as shown in FIG. 4A, the upper and lower plate members 63, 63 face the bag body 100 transferred from the positioning apparatus 32 so as to be above and below the opening 101.

[0058] Next, as shown in FIG. 4B, the upper frame 61A and the lower frame 61B are brought closer to each other by the nip cylinder 62 of FIG. 3, thereby clamping the bag body 100 with the upper and lower plate members 63, 63.

[0059] Then, as shown in FIG. 5A, as being clamped by the upper and lower plate members 63, 63, the bag body 100 is transferred toward the port welding apparatus 80.

[0060] In the course of this transfer, as shown in FIG. 5B, the suction cups 64 are suctioned to the bag body 100 by the upper and lower air cylinders 67. Concurrently with this operation, as shown in FIG. 6A, the upper and lower plate members 63, 63 are moved closer to each other by rotating the arms 65, 65 in a direction in which the plate members 63, 63 come closer to each other. Also, the upper and lower suction cups 64 are moved away from each other by the air cylinders 67 to open the opening 101. These operations are performed while the upper frame 61A and the lower frame 61B are being moved from the positioning apparatus 32 to the port welding apparatus 80.

[0061] As described above, the port 200 is supplied by the port transfer apparatus 70 to the bag body 100 transported to the port welding apparatus 80 as being held in the opening transport apparatus 60 and with the opening 101 being open.

[0062] Next, the port transfer apparatus 70 is described.

[0063] As shown in FIG. 2, the port transfer apparatus 70 includes a plurality of holder units 72 spaced a predetermined distance apart from each other on an endless belt 71. By driving the belt 71 in a circulating manner by a motor not shown or the like, each holder unit 72 moves along a track of the belt 71.

[0064] As shown in FIG. 7 and FIG. 8, each holder unit 72 includes a port holder 73 where the port 200 supplied one by one by a port feeder not shown is held.

[0065] Also, on both sides of the port holder 73, paired clamp members 74A and 74B and also a driving unit (not shown) are provided. The clamp members 74A and 74B clamp the bag body 100 to which the port 200 is welded. The driving unit drives to open and close these clamp members 74A and 74B.

[0066] As shown in FIG. 8 and FIG. 9B, the port holder 73 includes a ring-shaped holder case 731. The holder case 731 includes an engaging unit 731a projecting from its front end toward its inner diameter direction. At the tip of this engaging unit 731a, an engaging surface 731b is formed. Note that a side on which the port 200 is held is taken as front in the port holder 73.

[0067] Inside the holder case 731, a hold ring 732 is provided. The hold ring 732 is a portion actually holding the port 200 in the port holder 73. As depicted in FIG. 9A, the hold ring 732 is formed of a combination of four-way-divided arc-shaped segments 732a to 732d in a ring shape. While four-way division is exemplarily shown herein, the number of divisions can be any.

[0068] The segments 732a to 732d of the hold ring 732 each include an engaging surface 732f at its front end. The engaging surface 732f is formed at a position facing the engaging surface 731b of the holder case 731, with the hold ring 732 being arranged inside the holder case 731.

[0069] On an outer perimeter of the hold ring 732 (the segments 732a to 732d), a spring groove 732e is formed along a circumferential direction. In the spring groove 732e, a spiral spring 733 formed in a ring shape is arranged. As being accommodated in the spring groove 732e, the spiral spring 733 provides an elastic force oriented so as to reduce the diameter of the hold ring 732 (the segments 732a to 732d) (diameter reduction). By inserting a rear end of the port 200 against this elastic force along the inner perimeter of the hold ring 732, the hold ring 732 directly holds the port 200 with its inner perimeter. The spiral spring 733 is merely an example, and another elastic body such as a ring-shaped rubber can be widely applied.

[0070] With the engaging surface 731b of the holder case 731 and the engaging surface 732f of the hold ring 732 being in contact with each other and also with the inner peripheral surface of the hold ring 732 and a support surface 734a of a rotary shaft 734 being in contact with each other, the hold ring 732 is held in the holder case 731 with the diameter reduced most.

[0071] Here, a space S is provided between the outer perimeter of the hold ring 732 and the inner perimeter of the holder case 731. Therefore, when a force larger than the elastic force is applied to the port 200, the port 200 can be displaced in a diameter direction against the elastic force. The displacement is regulated within a range of the space S. That is, the holder case 731 regulates the amount of displacement of the spiral spring 733 (the port 200). The space S is set according to a positioning error in the belt driven type. For example, the positioning error is on the order of 0.2 mm to 0.3 mm, it is enough to ensure the space S on the order of 0.5 mm.

[0072] The port holder 73 includes the rotary shaft 734 supporting the holder case 731 and the hold ring 732 on their front end side. The holder case 731 is fixed to the rotary shaft 734 with a bolt B. Thereby, the hold ring 732 is held between the holder case 731 and the rotary shaft 734.

[0073] The rotary shaft 734 penetrates through a shaft hole 735a via a flange bushing 736, and is rotatably supported to a holding block 735.

[0074] On the front end side of the rotary shaft 734, a pin fixing shaft 737 is provided coaxially with the rotary shaft 734. The pin fixing shaft 737 supports a port support pin 738 at a front end exposed to the outside of the rotary shaft

734. The port support pin 738 fits in a hollow part of the port 200 held by the hold ring 732 to more ensure the holding of the port 200.

[0075] A gear 79 is fixed onto a rear side of the rotary shaft 734. When the port 200 is preheated, the rotary shaft 734 is driven for rotation via the gear 79 by a motor 78c of a port rotating mechanism 78, which will be described further below.

[0076] A slide block 39 is connected to a lower portion of the holding block 735. The slide block 739 is fixed to the belt 71. Also, the slide block 739 is slidably held to a guide rail 71a parallel to the belt 71. By driving the belt 71, the holder unit 72 moves as being guided by the guide rail 71a.

[0077] The port 200 held by the holder unit 72 is first transported to a port preheating apparatus 76.

[0078] As shown in FIG. 10, the port preheating apparatus 76 includes an air heater 77 blowing hot air to preheat the port 200 held by the holder unit 72 and the port rotating mechanism 78 rotating the port holder 73 holding the port 200.

[0079] The port rotating mechanism 78 has a plate 78a. The plate 78a is provided with a gear 78b, the motor 78c for driving the gear 78b for rotation, and pulleys 78d and 78e and a belt 78f for transmitting a rotation driving force of the motor 78c to the gear 78b. This plate 78a is driven by an air cylinder 78g in a vertical direction.

[0080] On the other hand, in the holder unit 72, the port holder 73 is rotatably provided about an axial line of the held port 200 and, furthermore, the gear 79 is provided coaxially with the port holder 73. With this gear 79, the gear 78b is engaged when the plate 78a of the port preheating apparatus 76 is caused to descend by the air cylinder 78g. Then, by driving the motor 78c, the port holder 73 is driven for rotation. In accordance with this rotation, the hold ring 732 is also rotated.

[0081] To prevent a core deviation at the time of preheating the port 200, the port attaching unit 40 includes the port aligning apparatus 90. The port aligning apparatus 90 is provided correspondingly to the port preheating apparatus 76, as shown in FIG. 2.

[0082] As shown in FIG. 11, the port aligning apparatus 90 includes an air cylinder 91 fixed to a mount arm 96. The mount arm 96 is fixed, via appropriate means, to a reference surface where the resin bag manufacturing equipment 10 is placed. Thus, the port aligning apparatus 90 is accurately placed at a fixed position with respect to the port preheating apparatus 76. The air cylinder 91 includes a shaft 92 that moves toward and away from the port holder 73. At the tip of this shaft 92, a centering pin 95 is fixed via an intermediate shaft 93 and a ball bearing 94. The centering pin 95 is configured of a projection 95a in the shape of a truncated cone formed on a tip side facing the port holder 73 and a base part 95b connected to the projection 95a and shaped in a hollow cylindrical shape. The ball bearing 94 is engaged with base part 95b.

[0083] When the port 200 is preheated, the shaft 92 of the air cylinder 91 is moved from a retreated position (a first position) to a position shown in FIG. 11 (a second position). Thereby, the projection 95a of the centering pin 95 is inserted inside the port 200 held by the port holder 73. Also, the front end of the port 200 is pressed onto the front end of the base part 95b of the centering pin 95. In this state, when the motor 78c is driven, in accordance with the port holder 73 and the port 200 being driven for rotation, the centering pin 95 is driven for rotation. Here, with the centering pin 95 pressing the port 200, the port 200 can be displaced against the elastic force applied to the hold ring 732 by the spiral spring 733. Therefore, even if the port 200 is held by the hold ring 732 at a shifted position with respect to the air heater 77, the port 200 moves to an appropriate position following the centering pin 95 placed at an accurate position. Therefore, a distance from the port 200 to the air heater 77 can be accurately adjusted. As a result, the port 200 can be uniformly molten by preheating.

[0084] Thus, in the port rotating mechanism 78, while the port 200 held by the port holder 73 is being rotated, hot air is blown from the air heater 77, thereby uniformly preheating the port 200.

[0085] As shown in FIG. 2, two above-structured port preheating apparatuses 76 are equipped correspondingly to the process unit being two bag bodies 100. Furthermore, in the present embodiment, two sets of two apparatuses are provided for allowing two-step preheating.

[0086] The port 200 preheated by the port preheating apparatuses 76 is transferred to the port welding apparatus 80 as being held by the holder unit 72.

[0087] Then, as shown in FIG. 6A, the bag body 100 held by the opening transport apparatus 60 and further with the opening 101 being open and the port 200 held by the holder unit 72 face each other.

[0088] Subsequently, as shown in FIG. 6B, suction by the upper and lower suction cups 64, 64 is set at OFF, and the upper frame 61A and the lower frame 61B are moved by the advancing and retreating cylinder 68 of FIG. 3 to advance. Then, as shown in FIG. 12A, the port 200 held by the holder unit 72 is promptly inserted into the opening 101 of the bag body 100. Here, even if suction by the upper and lower suction cups 64, 64 is set at OFF, the upper and lower plate members 63 and 63 come close to each other to keep an open state of the opening 101.

[0089] Next, the upper and lower plate members 63 and 63 are opened by being rotated, thereby releasing the narrowed state of the opening 101. In this state, with the port welding apparatus 80, the opening 101 of the bag body 100 and the port 200 inserted in the opening 101 are welded to each other. For this reason, the port welding apparatus 80 includes paired upper and lower port seal molds 81, 81. The port seal molds 81 include recessed parts 81a, 81a facing the bag body 100 and each shaped in a semicircle according to the outer peripheral shape of the port 200 and flat parts 81b,

81b on both ends thereof. These port seal molds 81, 81 are heated by a heater not shown within a predetermined temperature range. Also, the port seal molds 81, 81 are driven by an air cylinder or the like not shown in a vertical direction, thereby being movable come close to or away from the bag body 100 and the port 200.

[0090] As shown in FIG. 12B, in this port welding apparatus 80, the upper and lower port seal molds 81, 81 are brought closer to each other to be pressed onto the bag body 100 and the port 200. Then, the recessed parts 81a, 81a weld the opening 101 and the port 200 inserted therein to each other, and the flat parts 81b, 81b on both sides weld two films F to each other on both side of the opening 101. Thereby, the port 200 is welded to the bag body 100 to form a resin bag. Here, three sides of the bag body 100 have already been welded. Therefore, in welding of the opening 101 and the port 200, wrinkles are less prone to be produced on the films F forming the bag body 100.

[0091] When the port 200 is inserted into the recessed parts 81a, 81a of the port seal molds 81, 81, the position of the port 200 may be shifted with respected to the recessed parts 81a, 81a. This is because the port holder 73 holding the port 200 is driven by the belt 71. However, an elastic force oriented to diameter reduction is applied to the hold ring 732 of the port holder 73. For this reason, when a force larger than the elastic force is applied to the port 200 in the course of being inserted into the recessed parts 81a, 81a, the port 200 can be displaced against the elastic force applied to the hold ring 732. Therefore, even if the port 200 is inserted into a shifted position with respect to the recessed parts 81a, 81a, of the port seal molds 81, 81, in other words, a shifted position in the opening 101 of the bag body 100, the port 200 is in contact with the port seal molds 81, 81 and the port 200 is moved along the recessed parts 81a, 81a. Thereby, the port 200 is accurately positioned in the recessed parts 81a, 81a. As a result, the port 200 can be attached to the bag body 100 without inviting poor welding.

[0092] After welding is completed, as shown in FIG. 13A, the upper frame 61A and the lower frame 61B are spaced apart from each other by the nip cylinder 62 of FIG. 3, thereby releasing clamping of the bag body 100 by the upper and lower plate members 63, 63.

[0093] Thereafter, the upper frame 61A and the lower frame 61B retreat.

[0094] Subsequently, as shown in FIG. 13B, the port seal molds 81, 81 are separated away from each other and are pulled away from the bag body 100 and the port 200. In this state, the bag body 100 is welded to the port 200, and is held by the holder unit 72.

[0095] Thereafter, the holder unit 72 moves with the belt 71 being driven in a circular manner, and the bag body 100 (the resin bag) having the port 200 welded thereto is transferred to a port cooling apparatus not shown.

[0096] In the port cooling apparatus, a welded part of the port 200 and the bag body 100 is cooled by a cooling block or with cooling air blown thereto. When a cooling block is used, the cooling block is configured to have a shape similar to that of the port seal molds 81, 81 and operate similarly to the port seal molds 81, 81, and the cooling block is cooled in advance to a temperature sufficiently lower than a welding temperature and is then pressed onto the welding part of the port 200 and the bag body 100 from both surfaces for cooling.

[0097] Thereafter, the resin bag with the port 200 and the bag body 100 being welded to each other is transferred to the filling unit 50 corresponding to the downstream process, where the bag body 100 is filled with a content from the port 200 and a cap is mounted onto the port 200, for example.

[0098] As has been described in the foregoing, the port 200 held by the port holder 73 can be displaced when the port 200 receives a force larger than the elastic force applied to the hold ring 732 by the spiral spring 733.

[0099] Therefore, by pressing the port 200 with the centering pin 95 when preheated by the air heater 77, the port 200 can be moved to an appropriate position following the centering pin 95. Therefore, the port 200 can be uniformly welded at the time of preheating.

[0100] Also, when the port 200 is welded, the port 200 moves along the recessed parts 81a, 81a of the port seal molds 81, 81. Thereby, the port 200 is accurately positioned in the recessed parts 81a, 81a. As a result, the port 200 can be attached to the bag body 100 without inviting poor welding.

[0101] While the embodiment of the present invention has been described above, any of the structures described in the above embodiment can be selected, omitted, or modified as appropriate to another structure.

Reference Signs List

10 ...	resin bag manufacturing equipment
20...	body fabricating unit
30 ...	transfer unit
40 ...	port attaching unit
50 ...	filling unit
32 ...	positioning apparatus
321 ...	transfer conveyor
325 ...	transfer direction positioning guide

(continued)

	326 ...	first width direction positioning guide
	329 ...	second width direction positioning guide
5	34 ...	accumulating apparatus
	342 ...	bag accumulating container
	343 ...	ascending and descending table
	60 ...	opening transport apparatus
10	61A ...	upper frame
	61B ...	lower frame
	63 ...	plate member
	64 ...	suction cup
	70 ...	port transfer apparatus
15	71 ...	belt
	72 ...	holder unit
	73 ...	port holder
	731 ...	holder case
	732 ...	hold ring
20	732a to 732d ...	segment
	732e ...	spring groove
	733 ...	spiral spring
	734 ...	rotary shaft
25	738 ...	port support pin
	76 ...	port preheating apparatus
	77 ...	air heater
	78 ...	port rotating mechanism
	80 ...	port welding apparatus
30	81 ...	port seal mold
	81a ...	recessed part
	90 ...	port aligning apparatus
	91 ...	air cylinder
35	95 ...	centering pin
	95a ...	protrusion
	100 ...	bag body
	101 ...	opening
40	200 ...	port
	F ...	film
	S ...	space

Claims

- 45 1. Resin bag manufacturing equipment comprising:
- 50 a body fabricating unit that fabricates a bag body;
a port attaching unit that attaches, by welding, a port to the bag body fabricated by the bag body fabricating unit; and
a filling unit that fills the bag body with a content, the bag body having the port attached thereto by the port attaching unit,
the port attaching unit including a port holder that holds the port when the port is inserted into an opening of the bag body, and
55 the port holder comprising a ring-shaped holding body that is configured of a combination of a plurality of segments and directly holding the port, and an elastic body that applies an elastic force oriented to diameter reduction to the ring-shaped holding body.

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2. The resin bag manufacturing equipment according to claim 1, wherein the ring-shaped holding body holding the port is rotatably provided.

3. The resin bag manufacturing equipment according to claim 2, wherein the port attaching unit includes a centering member, the centering member is movable between a first position away from the port held by the ring-shaped holding body and a second position where the centering member makes contact with the port and pushes the port in an axial direction and the centering member is driven to rotate according to rotation of the ring-shaped holding body when the centering member is at the second position.

4. The resin bag manufacturing equipment according to any one of claims 1 to 3, further comprising a transfer unit that transfers the bag body manufactured by the body fabricating unit to the port attaching unit, wherein the transfer unit is provided with a positioning apparatus including a transfer direction guide engaging a tip part of the bag body in a transfer direction, and paired width direction guides being moved closer to and away from each other in a direction orthogonal to the transfer direction of the bag body.

5. The resin bag manufacturing equipment according to any one of claims 1 to 4, wherein the transfer unit includes an accumulating apparatus that accumulates the bag body without transporting the bag body to the port attaching unit when an anomaly occurs in either one or both of the port attaching unit and the filling unit that execute a downstream process.

FIG. 1

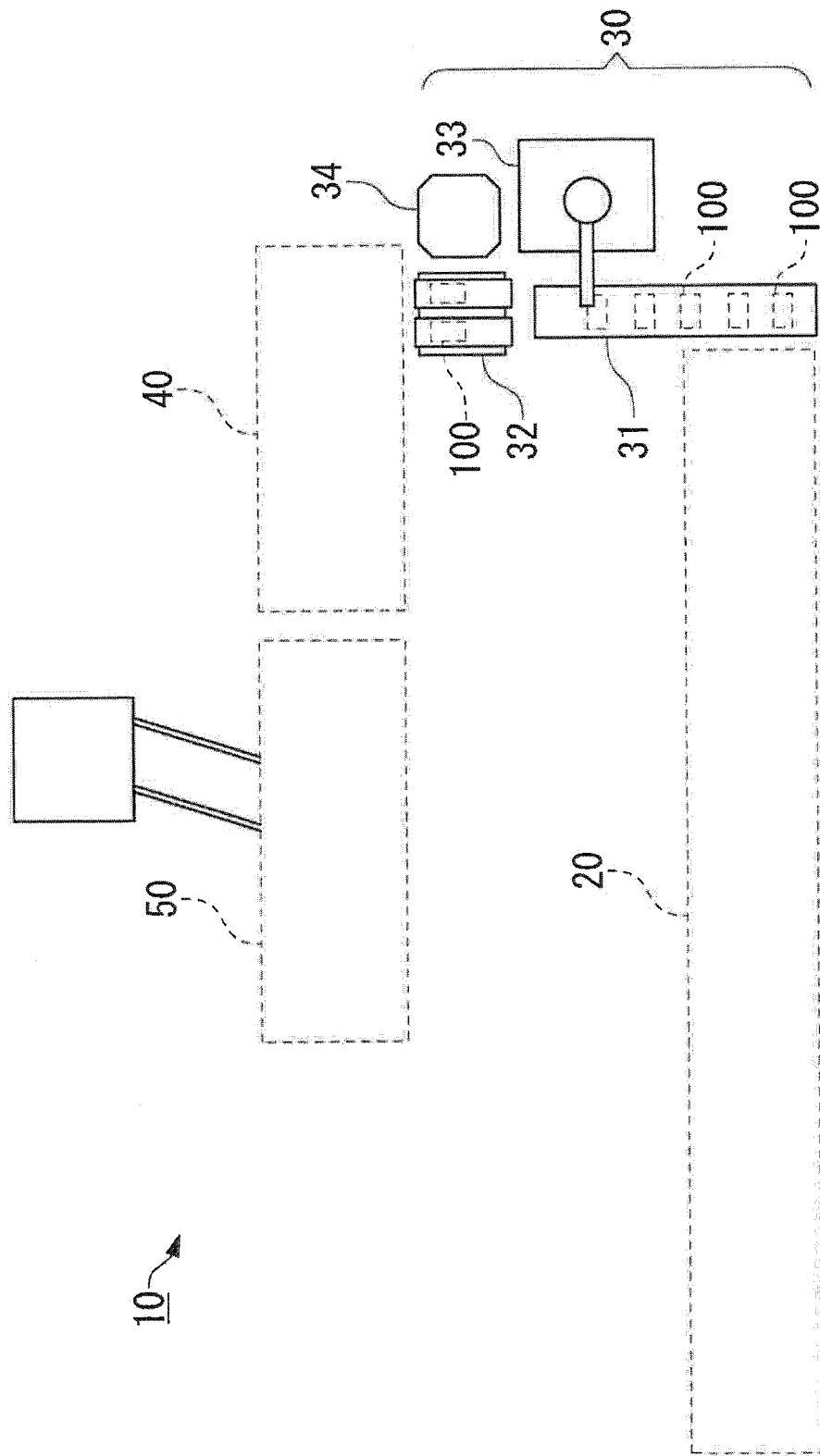


FIG. 2

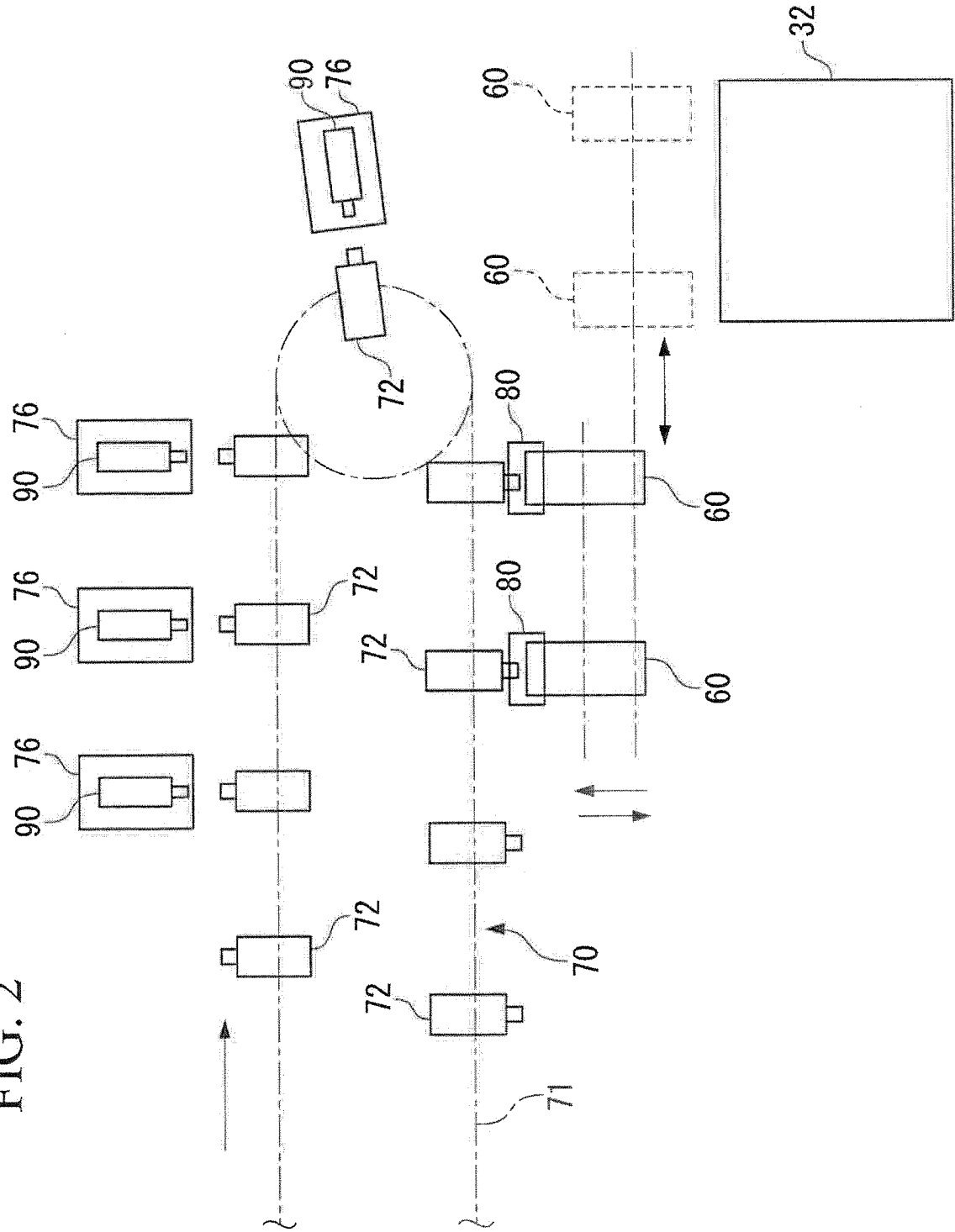


FIG. 3

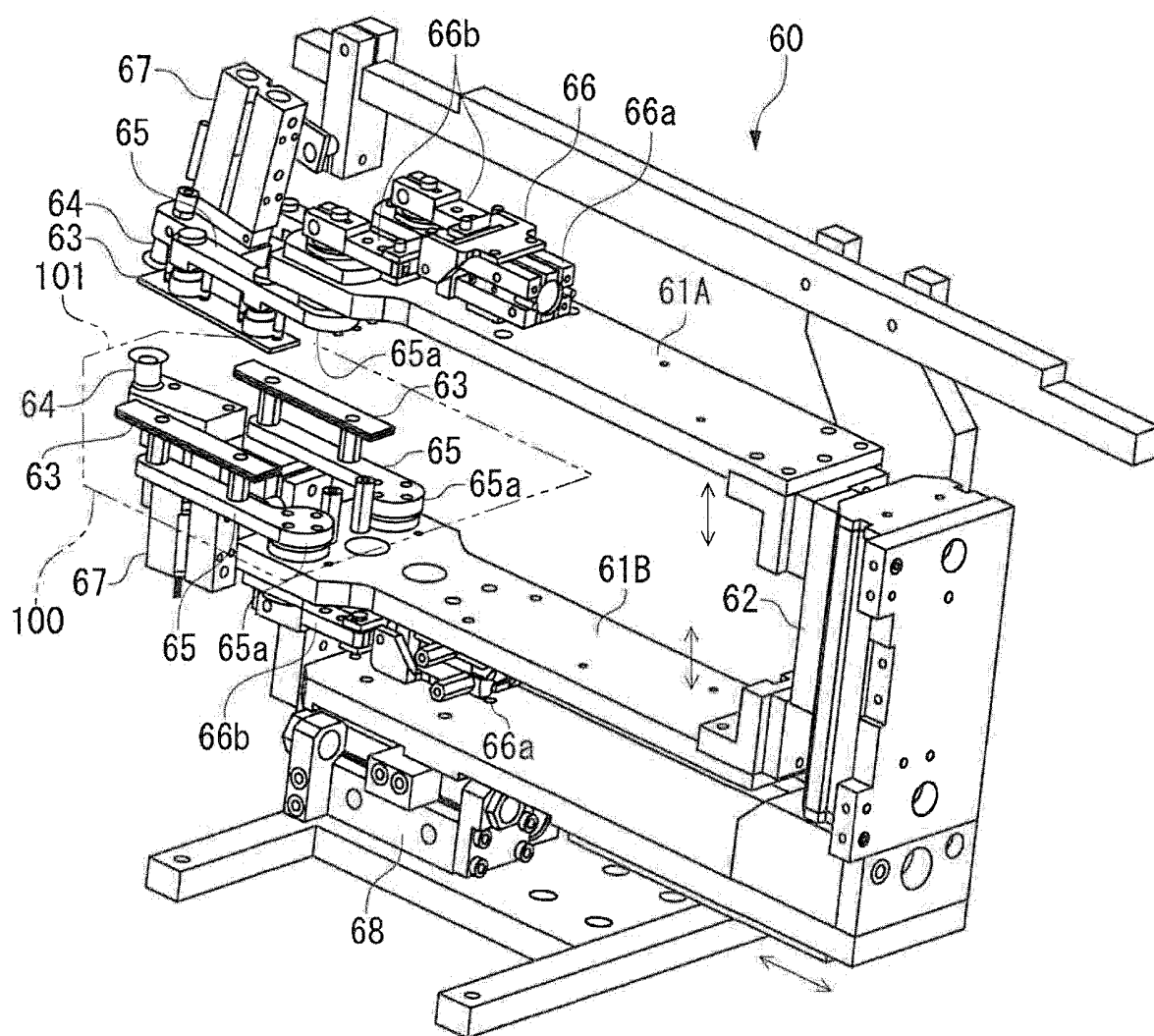


FIG. 4A

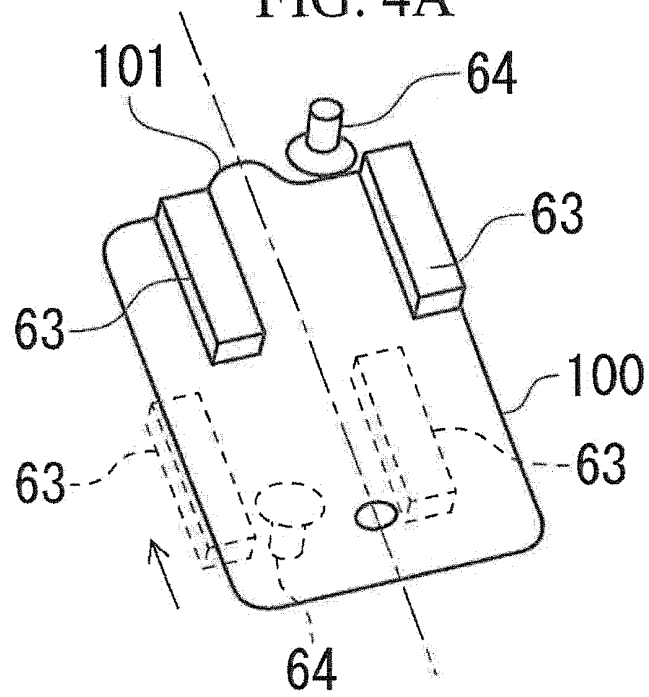


FIG. 4B

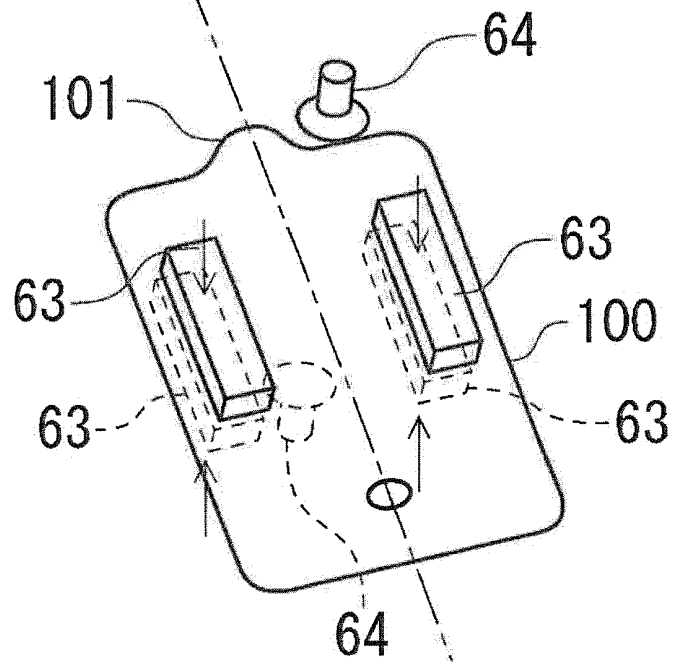


FIG. 5A

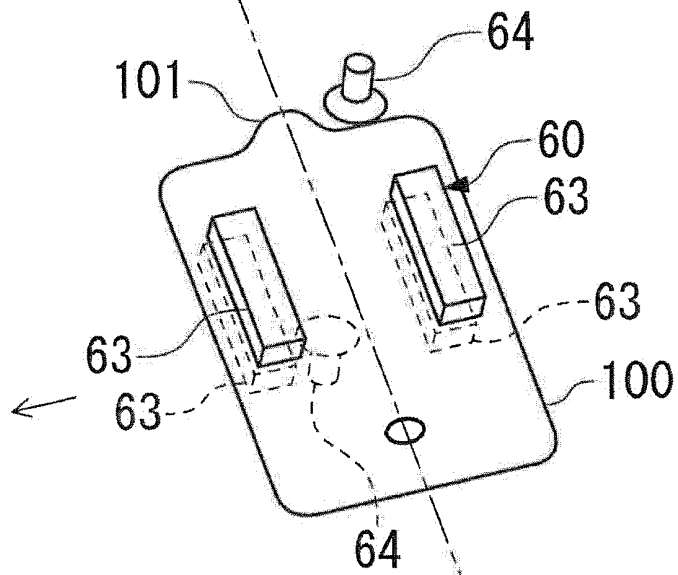
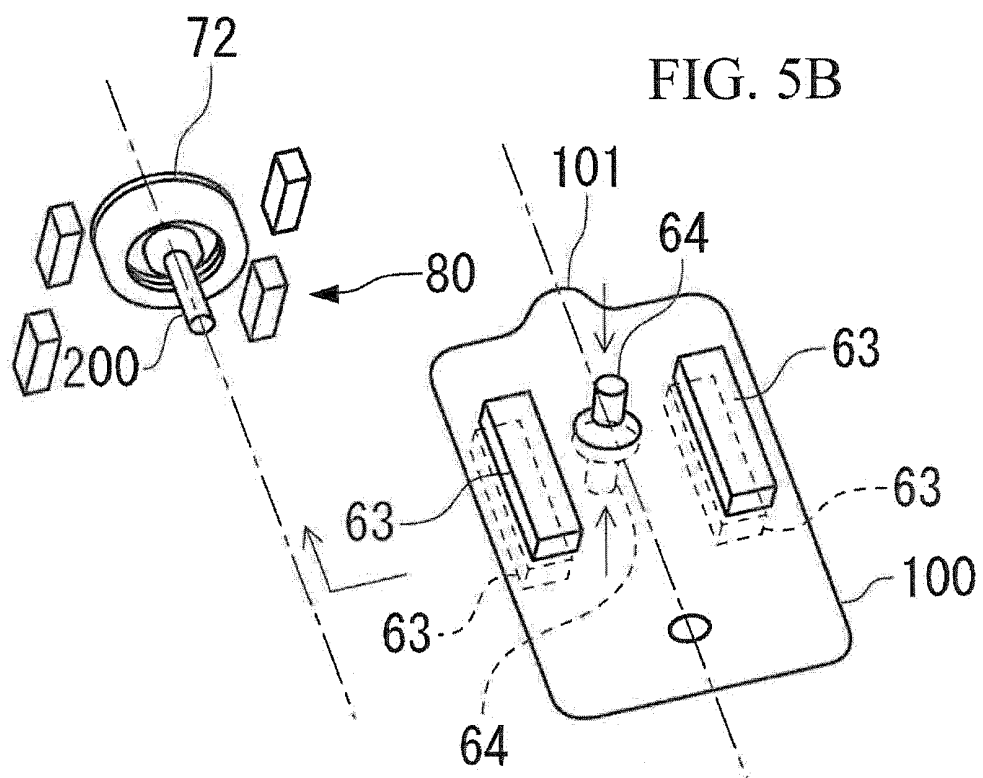


FIG. 5B



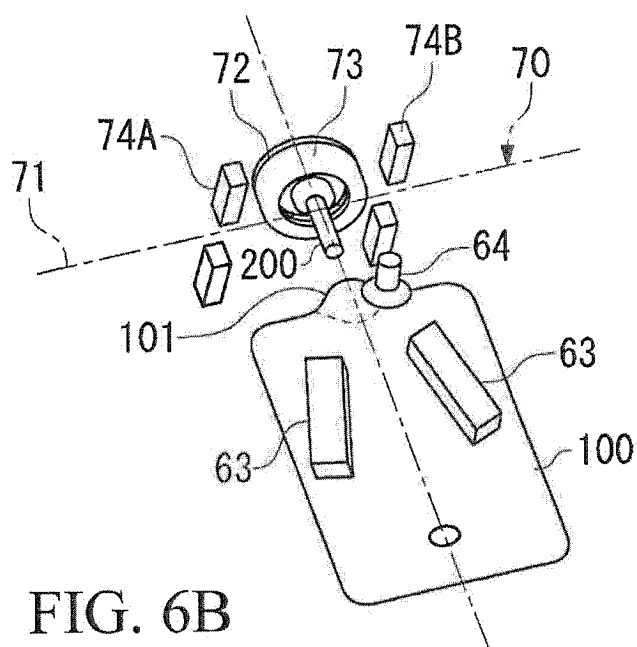
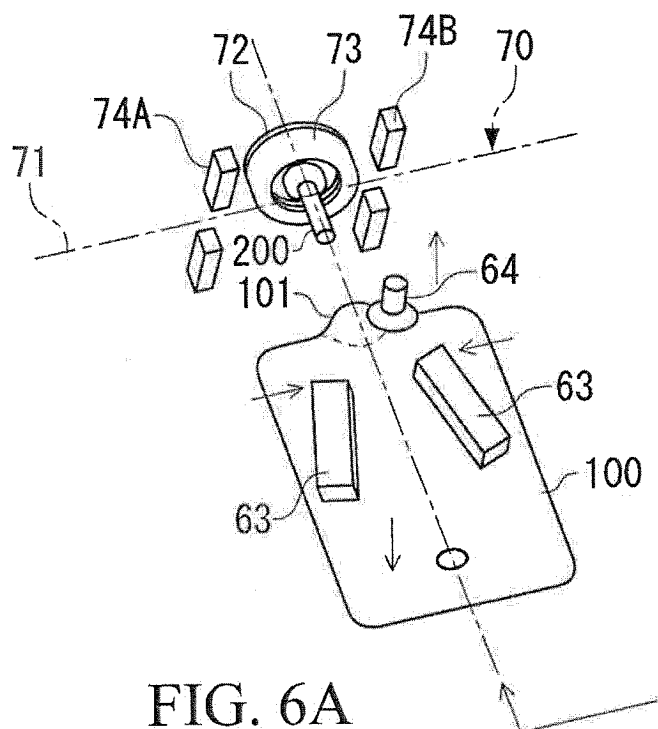


FIG. 7

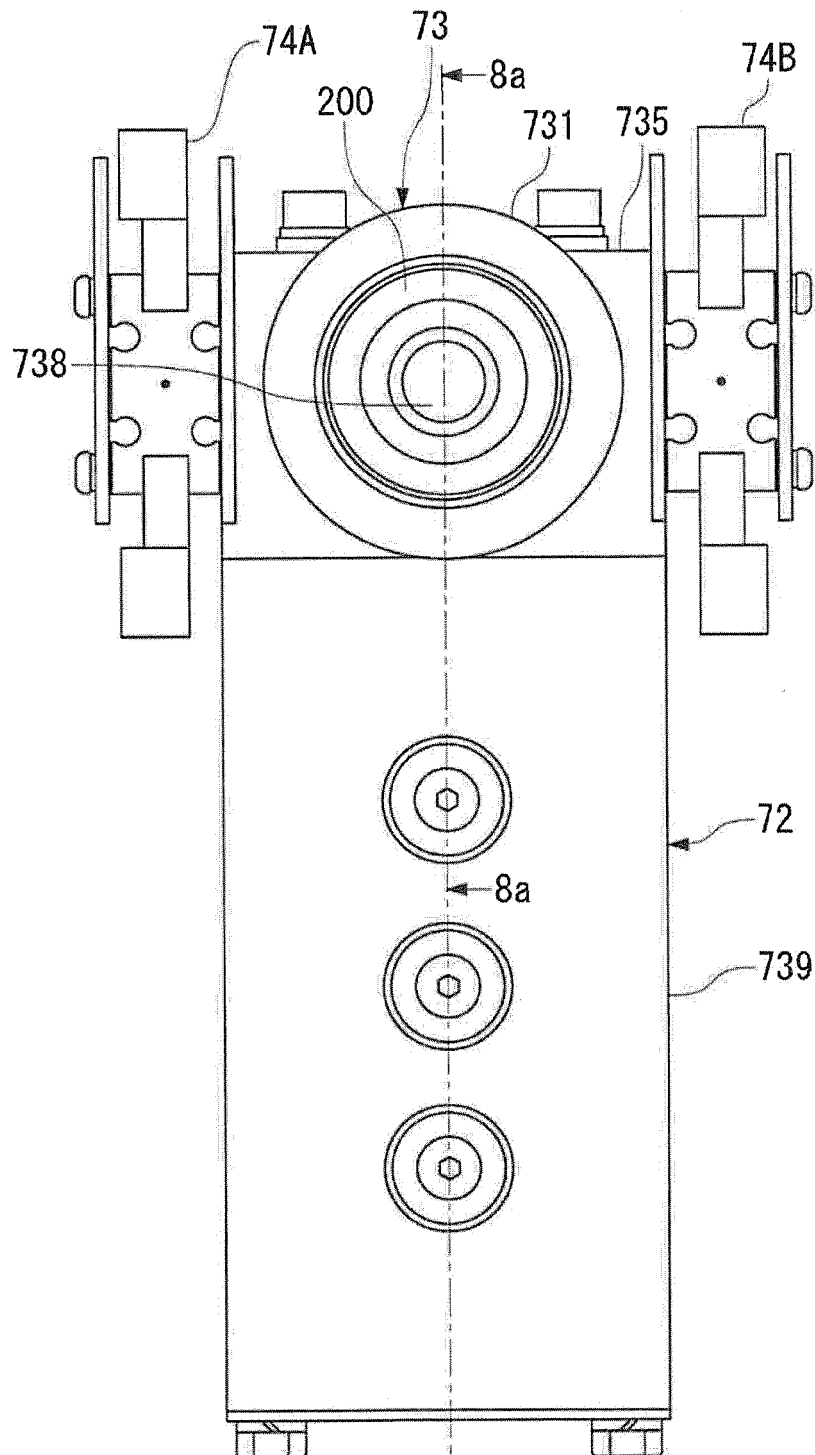


FIG. 8

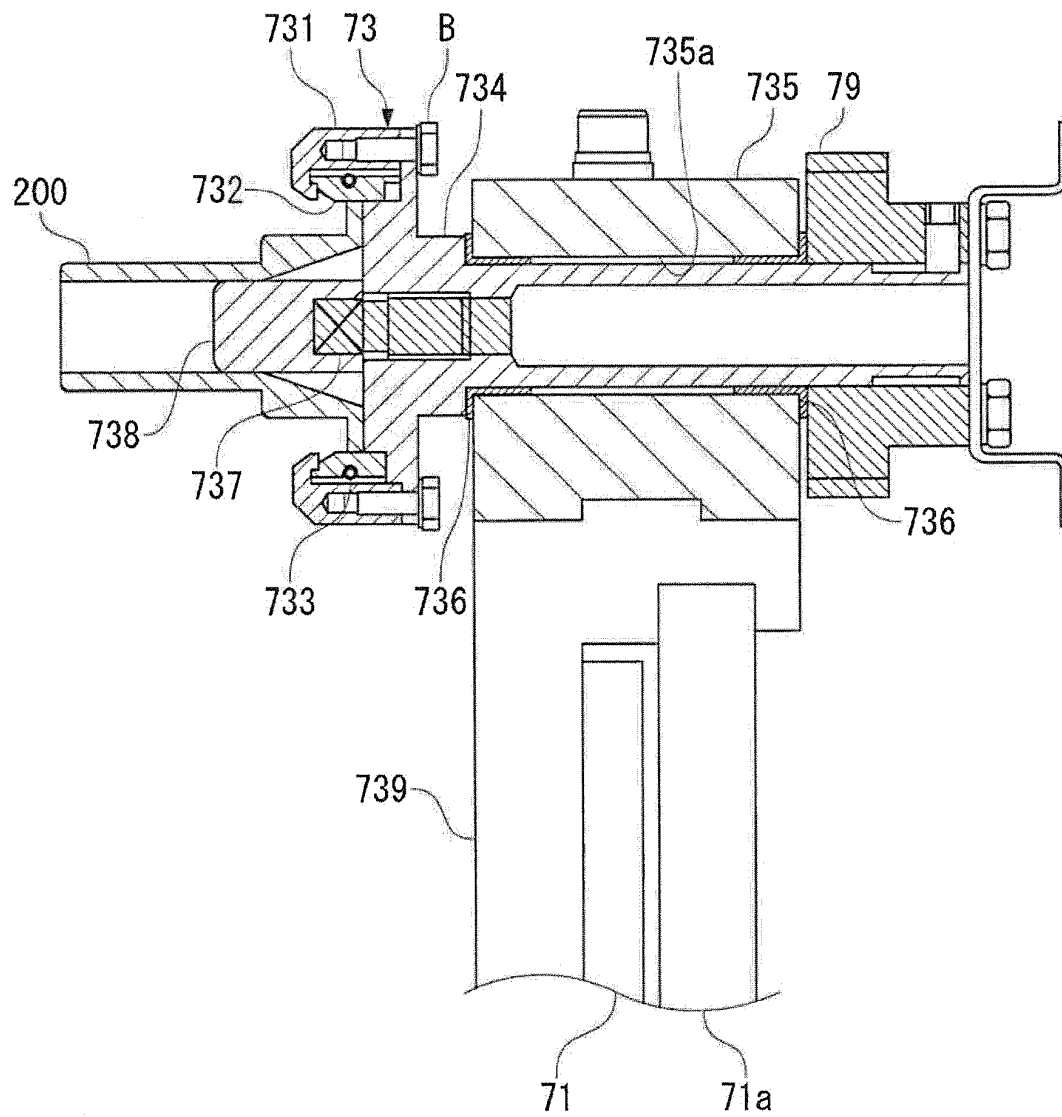


FIG. 9A

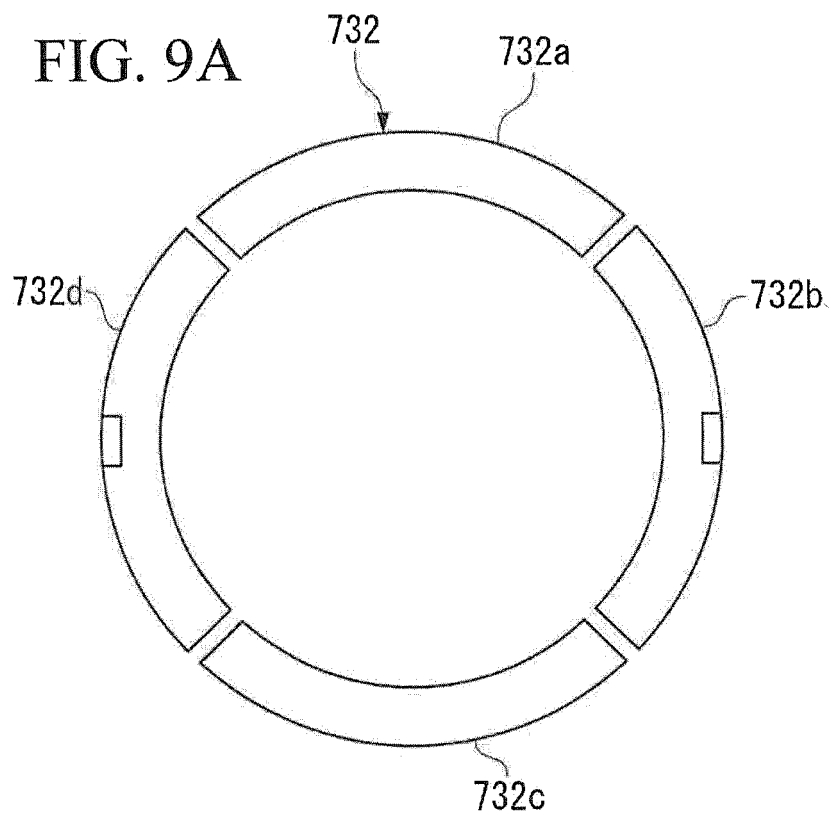


FIG. 9B

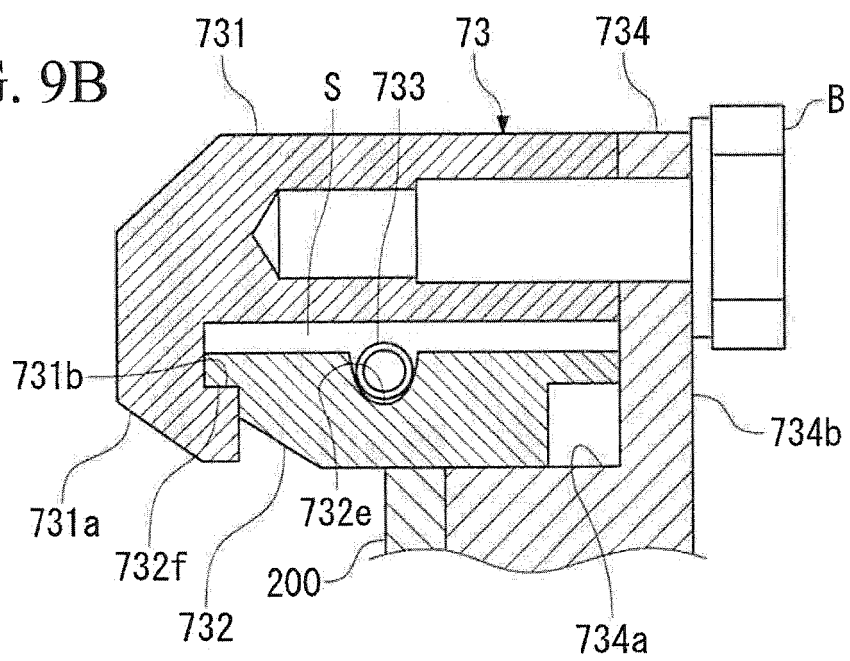
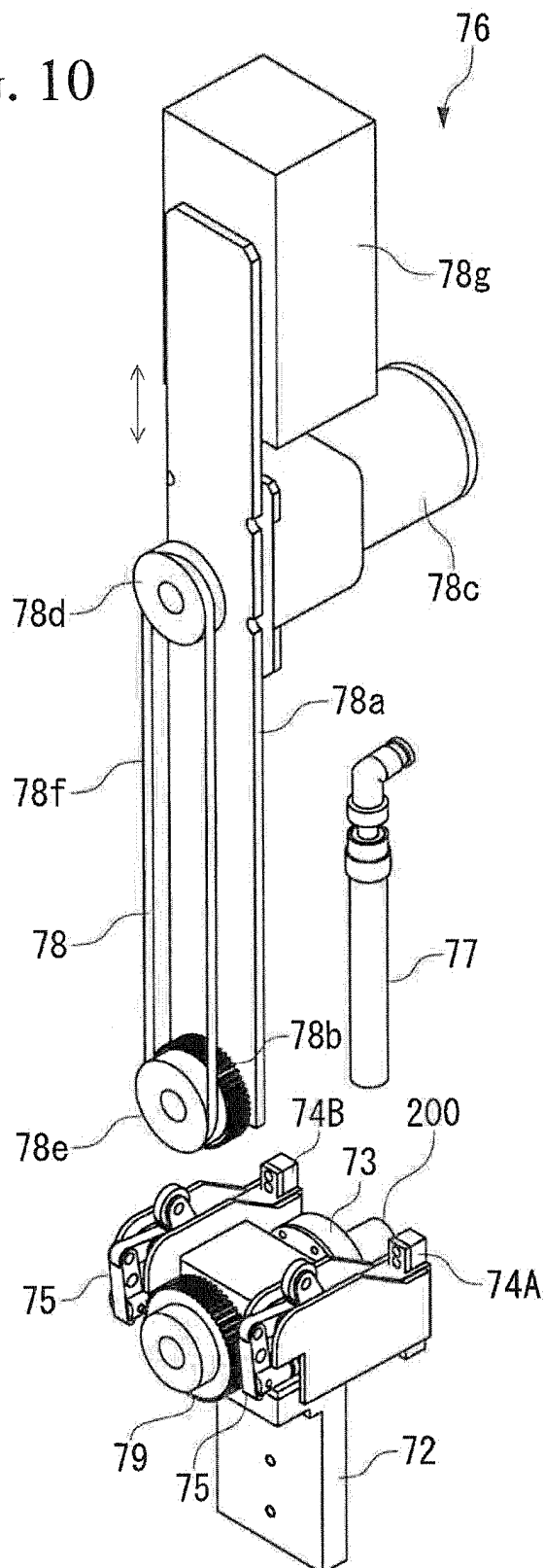


FIG. 10



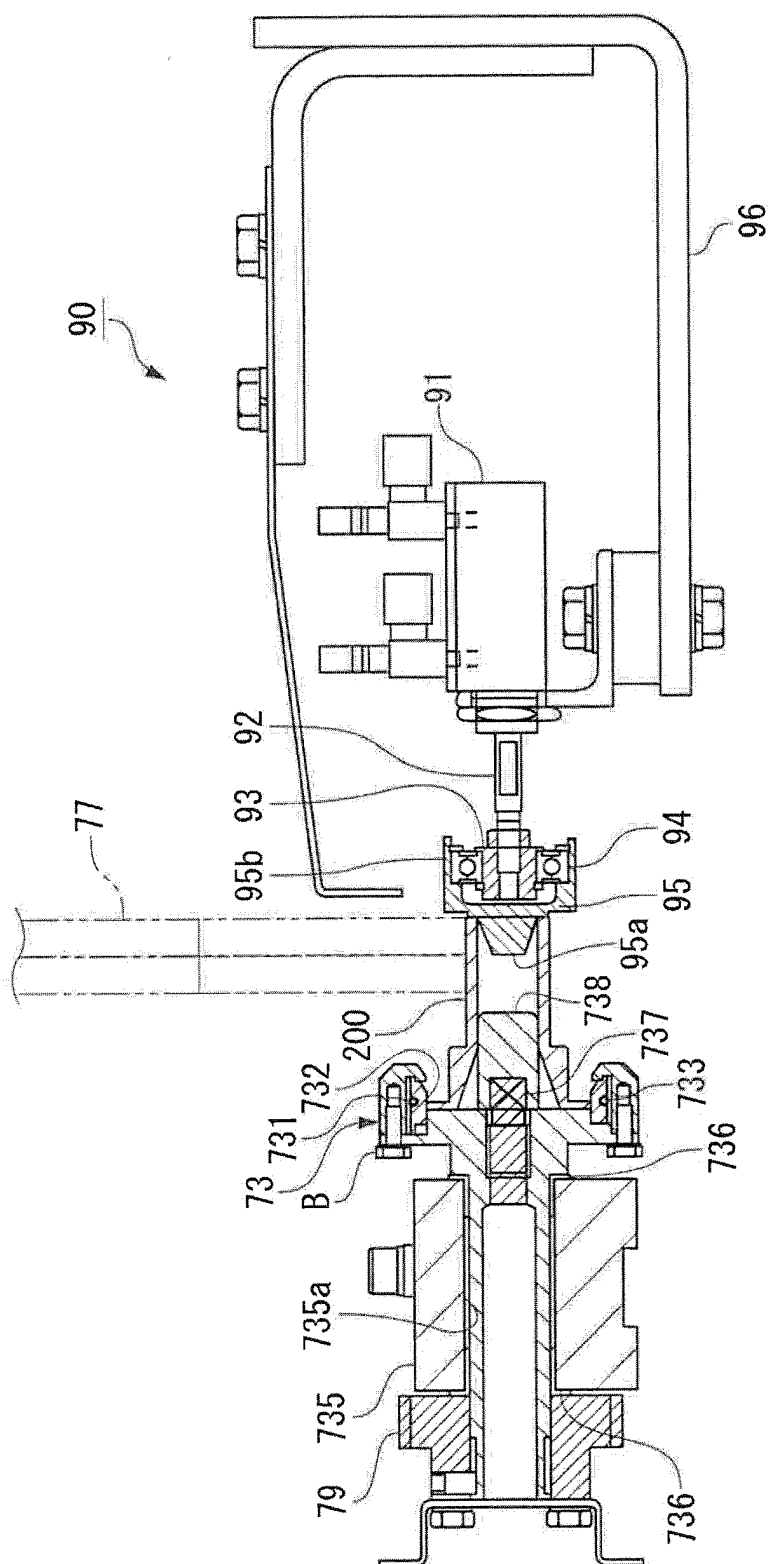


FIG. 11

FIG. 12A

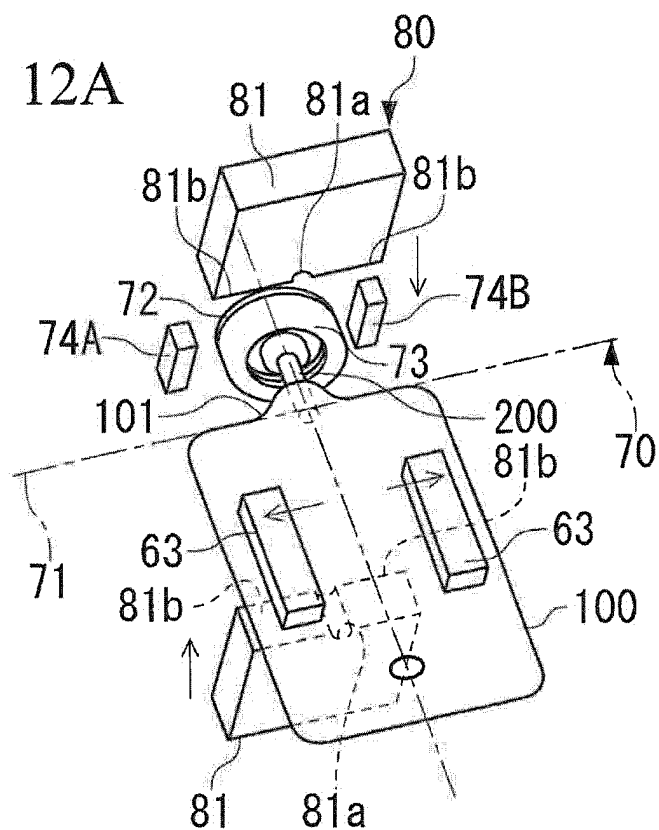
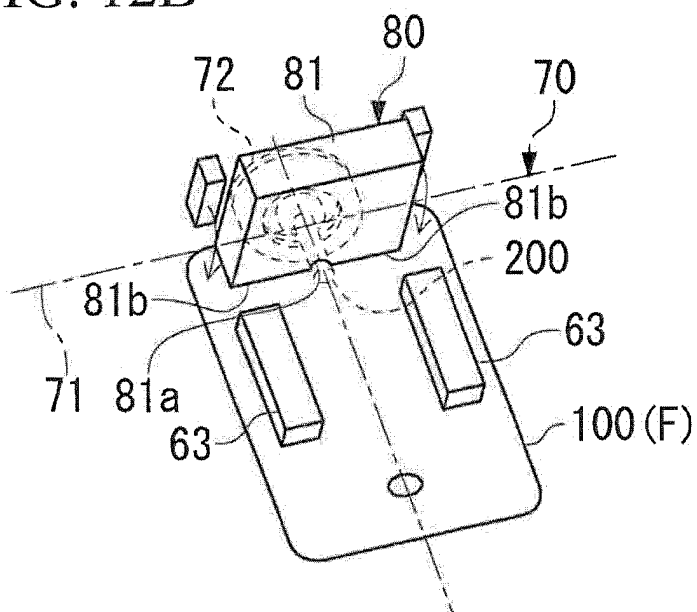


FIG. 12B



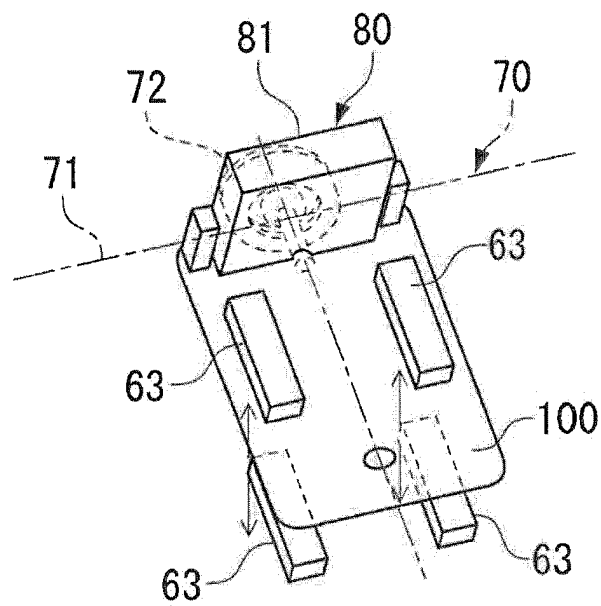


FIG. 13A

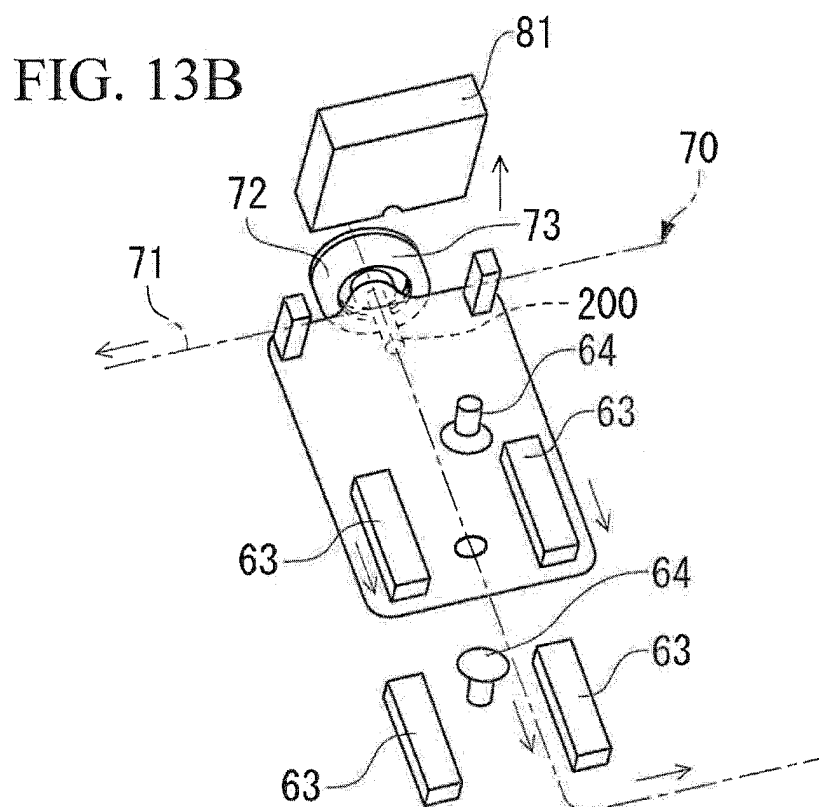


FIG. 14

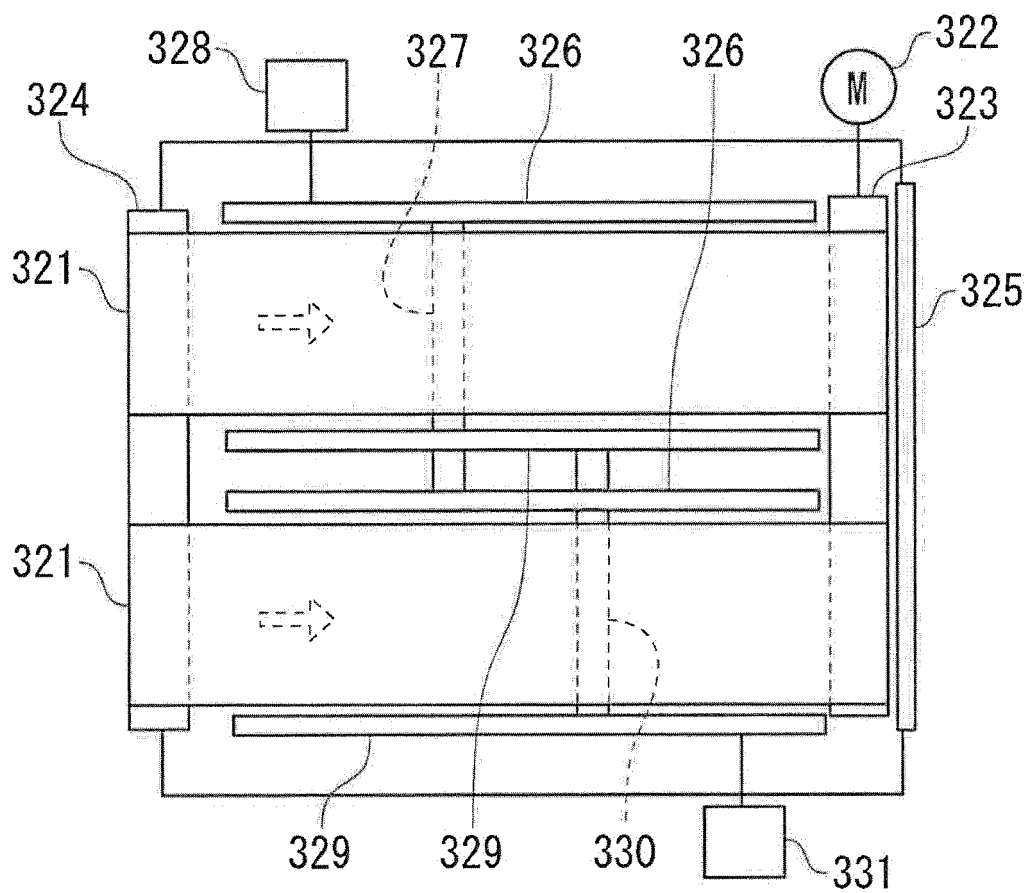


FIG. 15A

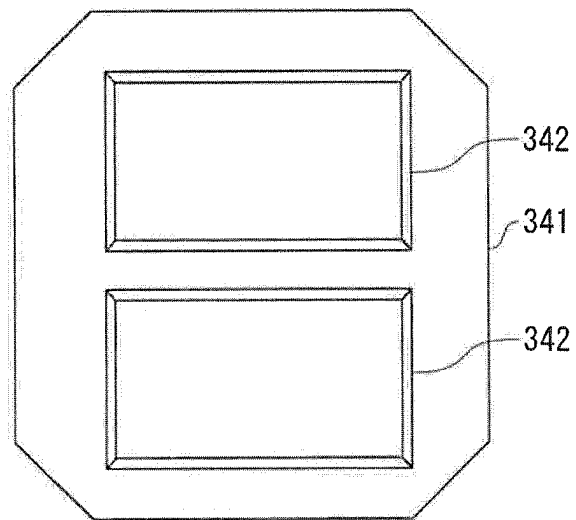
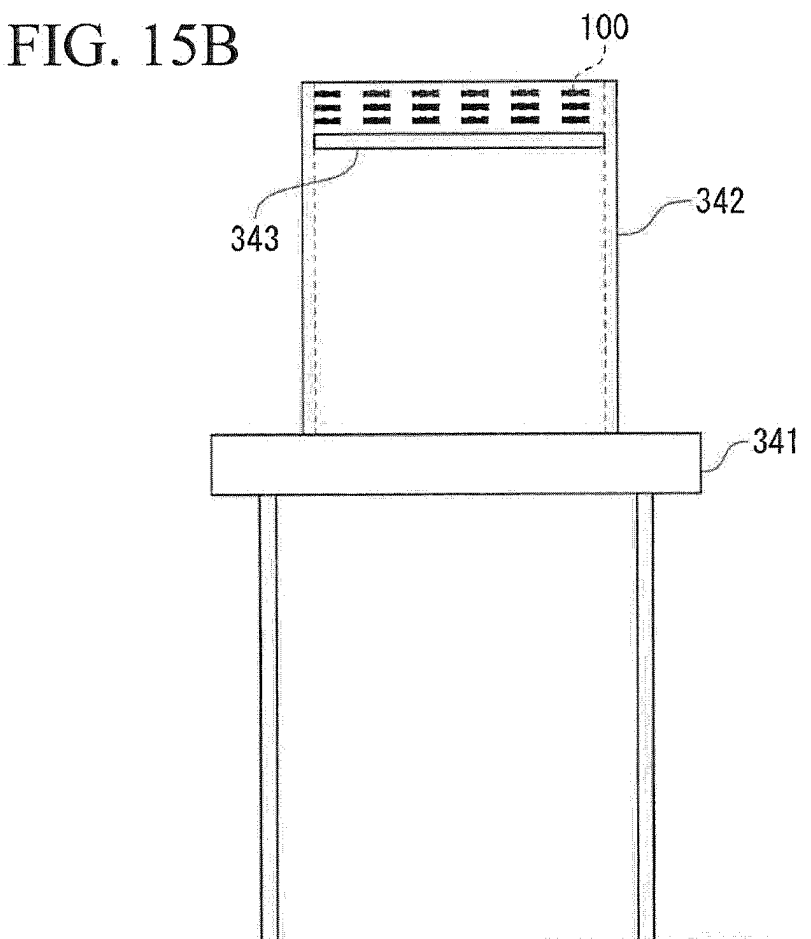


FIG. 15B



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/005539

A. CLASSIFICATION OF SUBJECT MATTER

B31B1/84(2006.01)i, B31B19/84(2006.01)i, B65B57/00(2006.01)i, B65G21/20(2006.01)i, B65G47/88(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B31B1/84, B31B19/84, B65B57/00, B65G21/20, B65G47/88

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2008-093836 A (Fuji Seal International, Inc.), 24 April 2008 (24.04.2008), paragraphs [0016] to [0044]; fig. 1 to 17 (Family: none)	1-2, 4-5 3
Y A	JP 2004-042447 A (Toyo Jidoki Co., Ltd.), 12 February 2004 (12.02.2004), paragraphs [0014] to [0042]; fig. 1 to 15 & US 2004/0011001 A1 & US 2004/0011008 A1 & US 2004/0014577 A1 & EP 1380503 A1 & EP 1380504 A1 & EP 1380505 A1	1-2, 4-5 3
Y	JP 2003-118748 A (Nipro Corp.), 23 April 2003 (23.04.2003), paragraph [0011] (Family: none)	2, 4-5

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
24 November, 2010 (24.11.10)

Date of mailing of the international search report
07 December, 2010 (07.12.10)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/005539

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 04-062041 A (Hitachi Zosen Trading & Mfg. Co., Ltd.), 27 February 1992 (27.02.1992), page 3, upper left column, line 5 to lower left column, line 9; fig. 3 to 5 (Family: none)	2, 4-5
A	JP 2004-136904 A (Hitachi Zosen Corp.), 13 May 2004 (13.05.2004), paragraphs [0019] to [0045]; fig. 1 to 11 (Family: none)	1-5
A	JP 04-062040 A (Hitachi Zosen Trading & Mfg. Co., Ltd.), 27 February 1992 (27.02.1992), (Family: none)	1-5
A	JP 60-189433 A (Toyo Food Equipment Co., Ltd.), 26 September 1985 (26.09.1985), (Family: none)	1-5

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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- WO 2010023753 A [0004]