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

(11) EP 1 298 062 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.09.2004 Bulletin 2004/40

(51) Int Cl.[7]: **B65B 59/02**, B65B 7/28

(21) Application number: **02011174.6**

(22) Date of filing: **21.05.2002**

(54) **Container follow-up type packaging machinery system**

Folgesystem für Behälter in einer Verpackungsmaschine

Système de suivi pour des conteneurs dans des machines d' emballage

(84) Designated Contracting States:
DE FR GB

(30) Priority: **28.09.2001 JP 2001303774**

(43) Date of publication of application:
02.04.2003 Bulletin 2003/14

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Description

[0001] The present invention relates to a container follow-up type packaging machinery system in which a plurality of processing stations such as a washer, a filler, and a capper for performing various packing processings to a container serving as a packing processing target are arranged along a container conveying path to convey the container.

[0002] Generally, a container follow-up type packaging machinery system has a container conveying path such as a conveyor (container conveying device) for conveying a container as a packing processing target, and a plurality of processing stations for performing various packing processings to the container. As the processing stations, for example, there are a washer for washing the container, a filler for filling the container with a liquid, and a capper for attaching a cap to the mouth of the container. The processing stations are sequentially disposed along the conveyor. The processing stations perform the various packing processings to the containers which are successively or intermittently conveyed by the conveyor.

[0003] There is also a line type follow-up type packaging machine such as a filler or a capper which performs a processing such as filling with a liquid or capping to containers conveyed on a conveyor at fixed speed without obstructing the flow of the containers. The line type follow-up type packaging machine has a follow-up device which moves so as to follow the container conveying operation of the conveyor. A work unit assembly is provided for the follow-up device. In the work unit assembly, a plurality of work units (heads) for performing the same packing processing to the containers are linearly arranged along the container conveying direction of the conveyor.

[0004] The containers to be supplied to a product manufacturing line of the container follow-up type packaging machinery system are automatically and sequentially transferred to the processing stations and are then subjected to predetermined packing processings.

[0005] In many cases, packaging machines such as the washer, filler, and capper are operated in such a state that each capacity set upon installation is held as it is. In some cases, due to a change in material (liquid to be packed, the shape of a cap, or the properties of the material) after the installation, the capacity of any of the processing stations (machines) on the product manufacturing line cannot satisfy desired throughput. In this case, container transfer speed on the product manufacturing line is set in accordance with the low throughput of the machine. Accordingly, the machines other than the low-throughput machine are operated so as to exhibit throughput lower than operable throughput. Consequently, the capacity of the whole product manufacturing line has to be lowered and then used.

[0006] In the line type follow-up type packaging machine, the number of work units (heads) built in the follow-up device of each processing station is predetermined. The moving distance of the follow-up device for following the transfer operation of the container conveyed by the conveyor varies in accordance with the number of work units (heads) built in the follow-up device of each processing station. Accordingly, when the number of work units (heads) built in the follow-up device is increased or reduced, the moving distance of the follow-up device varies as compared with the distance set initially. Consequently, when the number of work units (heads) is increased or decreased from the number set initially, it is necessary to extensively modify the design of a driving unit of the whole container follow-up type packaging machinery system in accordance with the change of the moving distance of the follow-up device of the processing station. Accordingly, after installation, it is difficult to change the number of work units (heads) built in the follow-up device of each processing station included in the container follow-up type packaging machinery system.

[0007] As mentioned above, in the conventional container follow-up type packaging machinery system, the capacity of a machine alone having low throughput cannot easily be raised. Actually, the development of a method for enabling to easily raise the capacity of a machine alone having low throughput is desired.

[0008] The present invention is made by paying attention to the above situation. It is an object of the present invention to provide a container follow-up type packaging machinery system in which the configuration of the whole system can easily be adapted in accordance with an increase or decrease in the number of work units (heads) of a follow-up device and a container follow-up type packaging machinery such as a filler or a capper can have versatility during changing the capacity of the packaging machine.

[0009] According to claim 1 of the present invention, there is provided a container follow-up type packaging machinery system in which a plurality of processing stations which perform various packing processings to containers serving as a packing processing target are arranged along a container conveying path of a container conveying device which conveys the containers, and a follow-up device which moves so as to follow the containers conveying operation of the container conveying device is provided for each processing station, characterized by further including

a work unit assembly, in which a plurality of work units which perform the various packing processings to the containers are linearly arranged along the container conveying direction of the container conveying device, is provided for at least one of the processing stations,

a processing-station capacity changing unit which changes the capacity of the processing station by changing the number of work units included in the work unit assembly, and

the processing-station capacity changing unit including moving stroke changing portion which changes

a moving stroke of the follow-up device in accordance with the number of work units.

[0010] According to claim 1 of the present invention, when the capacity of the processing station is changed, the processing-station capacity changing unit changes the number of work units included in the work unit assembly to change the capacity of the processing station, and the moving stroke changing portion of the processing-station capacity changing unit changes the moving stroke of the follow-up device in accordance with the number of work units.

[0011] According to claim 1 of the present invention, when the capacity of the processing station is changed, the processing-station capacity changing unit changes the number of work units of the work unit assembly to change the capacity of the processing station, and the moving stroke changing portion of the processing-station capacity changing unit changes the moving stroke of the follow-up device in accordance with the number of work units. Consequently, the system can easily be adapted in accordance with an increase or decrease in the number of work units (heads) of the follow-up device and the container follow-up type packaging machine such as a filler or a capper can have versatility during changing the capacity.

[0012] According to claim 2 of the present invention, in the container follow-up type packaging machinery system according to claim 1, characterized in that the processing station including the work unit assembly has a guide shaft which extends along the container conveying direction of the container conveying device to guide the movement of the follow-up device, a shaft supporting member which supports the guide shaft, and a rack which extends along the container conveying direction of the container conveying device,

the follow-up device has a bearing portion which is slidably connected to the guide shaft, a pinion gear which is engaged with the rack, and a driving motor which drives the pinion gear, and

the moving stroke changing portion has guide-shaft length adjusting portion which adjusts the length of the guide shaft in accordance with the length of the moving stroke, shaft-supporting-member length adjusting portion which comprises a plurality of shaft-supporting-member components to be coupled to each other to constitute the shaft supporting member and which changes the number of shaft-supporting-member components to be coupled in accordance with the length of the moving stroke, and rack length adjusting portion which comprises a plurality of rack components to be coupled to each other to constitute the rack and which changes the number of rack components in accordance with the length of the moving stroke.

[0013] According to claim 2 of the present invention, during a work in which the moving stroke changing portion changes the moving stroke of the follow-up device in accordance with the number of work units, the guide-shaft length adjusting portion adjusts the length of the guide shaft in accordance with the length of the moving stroke, the shaft-supporting-member length adjusting portion changes the number of components to be coupled to each other to constitute the shaft supporting member in accordance with the length of the moving stroke, and the rack length adjusting portion changes the number of rack components to be coupled in accordance with the length of the moving stroke.

[0014] According to claim 2 of the present invention, during the work in which the moving stroke changing portion changes the moving stroke of the follow-up device in accordance with the number of work units, the guide-shaft length adjusting portion adjusts the length of the guide shaft in accordance with the length of the moving stroke, the shaft-supporting-member length adjusting portion changes the number of components to be coupled to each other to constitute the shaft supporting member in accordance with the length of the moving stroke, and the rack length adjusting portion changes the number of rack components to be coupled in accordance with the length of the moving stroke. Consequently, the system can easily be adapted in accordance with an increase or decrease in the number of work units (heads) of the follow-up device and a container follow-up type packaging machinery such as a filler or a capper can has versatility during changing the capacity.

[0015] This summary of the invention does not necessarily describe all necessary features so that the invention may also be a sub-combination of these described features.

[0016] The invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view showing a schematic overall configuration of a line type capper in a container follow-up type packaging machinery system according to a first embodiment of the present invention;

FIG. 2 is a plan view showing a schematic overall configuration of the line type capper according to the first embodiment;

FIG. 3 is a schematic configuration view of a driving unit of a follow-up device in the line type capper according to the first embodiment, the follow-up device having the standard number of heads;

FIG. 4 is a schematic configuration view of the driving unit of the follow-up device in the line type capper according to the first embodiment, the follow-up device having the increased number of heads;

FIG. 5 is a plan view showing the schematic configuration of the driving unit of the follow-up device in the line type capper according to the first embodiment, the follow-up device having the standard number of heads;

FIG. 6 is a plan view showing the schematic configuration of the driving unit of the follow-up device in the line type capper according to the first embodiment, the follow-up device having the increased

number of heads;

FIG. 7 is a perspective view showing a cap chuck unit of the line type capper according to the first embodiment;

FIG. 8A is a perspective view showing a schematic configuration of a chuck-unit fixing base of the cap chuck unit in the line type capper according to the first embodiment, the cap chuck unit having the standard number of heads;

FIG. 8B is a perspective view showing the schematic configuration of the chuck-unit fixing base of the line type capper according to the first embodiment, the cap chuck unit having the increased number of heads;

FIG. 9 is a schematic configuration view of the essential parts of a line type capper according to a second embodiment of the present invention;

FIG. 10 is a schematic configuration view showing a driving mechanism of a follow-up device in the line type capper according to the second embodiment;

FIG. 11 is a diagram explaining a changing state of a moving stroke of the follow-up device in the line type capper according to the second embodiment;

FIG. 12A is a schematic configuration view showing the short distance between a driving timing pulley and a driven timing pulley in the line type capper according to the second embodiment;

FIG. 12B is a schematic configuration view showing the long distance between the driving timing pulley and the driven timing pulley in the line capper according to the second embodiment;

FIG. 13 is a schematic configuration view showing an electrical connecting state of the whole of a container follow-up type packaging machinery system according to a third embodiment of the present invention; and

FIG. 14 is a schematic configuration view showing a connecting state of a mechanical driving device for the whole of a conventional container follow-up type packaging machinery system.

[0017] A first embodiment of the present invention will now be described hereinbelow with reference to FIGS. 1 to 8B. FIGS. 1 and 2 show a schematic configuration of a line type packaging machine such as a capper 2. The capper 2 constitutes one part of a packing processing line in a container follow-up type packaging machinery system according to the present embodiment. In the packing processing line, processing stations such as a washer, a filler, and a capper which perform various packing processings to a container are sequentially disposed along a container conveying path such as a conveyor (container conveying device) for conveying a container as a packing processing target.

[0018] As shown in FIG. 1, the capper 2 has a frame 4 for supporting a follow-up device 18, which will be described later. The frame 4 has a conveyor (container conveying device) 6 for conveying a workpiece such as a container 8 thereon. As shown in FIG. 2, the conveyor conveys the containers 8 arranged at regular intervals (pitches) at fixed speed.

[0019] On the frame 4, a rack 12 extending in parallel with the conveying direction of the container 8 by the conveyor 6, and a pair of guide shafts 13 are disposed. As shown in FIG. 5, on the guide shafts 13, the follow-up device 18 that moves so as to follow the container conveying operation of the conveyor 6 is slidably arranged through sliding bearings 18a. Both the ends of each guide shaft 13 are fixed to the frame 4 through shaft blocks 15 and length adjusting means 69. The pair of guide shafts 13 form a work-unit conveying path having a proper length in parallel with the container conveying path of the conveyor 6.

[0020] As shown in FIG. 1, the follow-up device 18 has a first servo motor 16. A driving shaft of the motor 16 faces downward. A pinion gear 14 is attached to the driving shaft. The pinion gear 14 is engaged with the rack 12.

[0021] Accordingly, when the pinion gear 14 is rotated by the first servo motor 16, the follow-up device 18 is moved along the guide shafts 13 by a driving force transmitted through the engagement between the rack 12 and the pinion gear 14. When the first servo motor 16 is rotated forward, the follow-up device 18 is linearly moved in the same direction as that of the conveyor 6 so as to follow the container conveying operation of the conveyor 6. At that time, the follow-up device 18 is moved within a predetermined moving range guided by the pair of guide shafts 13.

[0022] When the first servo motor 16 is rotated backward, the follow-up device 18 is linearly moved (driven so as to return) in the direction opposite to the container conveying direction of the conveyor 6. In other words, the follow-up device 18 is driven reciprocatingly along the rack 12 and the guide shafts 13 within the predetermined range on the work-unit conveying path on the frame 4.

[0023] The first servo motor 16 feedback-controls a speed at which the follow-up device 18 moves so as to follow the container conveying operation of the conveyor 6. The moving speed of the follow-up device 18 is allowed to match the conveying speed of the container 8 by the conveyor 6. Further, when the pinion gear 14 moves from the vicinity of the center of the rack 12 and then reaches a predetermined position near the end of the rack 12, either of the following operations is selected as the operation of the first servo motor 16. As one selection, the first servo motor 16 is controlled so as to temporarily stop and, after that, the first servo motor 16 is rotated backward. As another selection, the first servo motor 16 is stopped.

[0024] The driving speed of the follow-up device 18 by the first servo motor 16 in the case where the follow-up device 18 is moved so as to follow the container conveying operation of the conveyor 6 can be equivalent to that of the follow-up device 18 in the case where the

follow-up device 18 is returned. They can also be remarkably different from each other.

[0025] Further, the follow-up device 18 has a second servo motor 20 that is adjacent to the first servo motor 16. The second servo motor 20 is arranged so that the driving shaft thereof faces in the direction opposite to that of the first servo motor 16 (upward). A timing pulley 22 is attached to the driving shaft of the second servo motor 20. The timing pulley 22 is engaged with a timing belt 24.

[0026] A capping head (work unit assembly) 34 is disposed above the follow-up device 18. As shown in FIG. 2, a plurality of cap chuck units (work units) 36 having the same configuration are arranged in line at the front end of the capping head 34. According to the present embodiment, three (standard number set initially) cap chuck units 36 are disposed. The three cap chuck units 36 are linearly arranged along the container conveying direction of the conveyor 6. Each cap chuck unit 36 downwardly extends from the front end of the capping head 34 substantially in the vertical direction as shown in FIG. 1.

[0027] An elevating drive portion 32A which is elevatingly drivable is disposed at the rear end of the capping head 34. The elevating drive portion 32A has a ball thread 26 for elevating drive. The ball thread 26 extends in the vertical direction. A timing pulley 28 is attached to the lower end of the ball thread 26. The timing pulley 28 is disposed substantially at the same height as that of the timing pulley 22 on the driving shaft of the second servo motor 20. The timing pulley 28 is engaged with the timing belt 24.

[0028] Further, a base member 32 of the follow-up device 18 has a bearing portion 30 having a nut-shaped thread groove that is engaged with the ball thread 26. Consequently, rotary torque caused by the rotation of the servo motor 20 is transmitted to the timing pulley 22 and, after that, the rotary torque is transmitted to the timing belt 24 engaged with the timing pulley 22. Further, the rotary torque is transmitted to the ball thread 26 through the timing pulley 28, so that the ball thread 26 is rotated. The rotation of the ball thread 26 is transformed into the elevating movement of the base member 32 through the engagement between the ball thread 26 and the bearing portion 30. Consequently, when the ball thread 26 is rotated in a predetermined direction, the overall capping head 34 is elevated through the base member 32. The three cap chuck units 36 are linearly elevated integrally with the capping head 34. When the cap chuck units 36 are elevated, the second servo motor 20 is feedback-controlled to appropriately control the amount of ascent or descent (amount of elevating movement) .

[0029] As shown in FIG. 1, a spindle 41 is disposed at the shaft center of the cap chuck unit 36. A timing pulley 38 is attached to the upper end of the spindle 41. A chuck portion 40 which grasps a cap 48 during capping is disposed at the lower end of the spindle 41. The chuck portion 40 is rotatably and openably supported by the cap chuck unit 36.

[0030] Further, three motors 42 preferably comprising servo motors are disposed to the capping head 34. As shown in FIG. 2, the three motors 42 are arranged in line in parallel with the three cap chuck units 36. As shown in FIG. 1, a timing pulley 44 is attached to the rotating shaft of each of the motors 42. Each timing pulley 44 is engaged with a timing belt 46. The timing belt 46 is engaged with the timing pulley 38 at the upper end of the cap chuck unit 36. Accordingly, when the motors 42 are rotated, the rotary torque of each motor 42 is transmitted to the timing belt 46 through the timing pulley 44. Further, the rotary torque is transmitted to the spindle 41 through the timing pulley 38. Then, the spindle 41 is rotated, so that the chuck portion 40 at the lower end of each cap chuck unit 36 is rotated. Consequently, when the cap 48 is attached to the container 8 during capping, the chuck portion 40 is rotated by the motor 42, so that the closing condition of the cap 48 is controlled to an optimum state to permit closing the cap.

[0031] Accordingly, the cap chuck unit 36 is linearly moved upward or downward with an adjustable moving stroke and is also rotated so that the container 8 is closed by the cap 48 with a proper force.

[0032] As shown in FIG. 2, the capper 2 has a cap shoot (cap conveying path) 50 through which the cap is supplied. The cap shoot 50 is arranged above the frame 4. Further, the end of the cap shoot 50 is arranged near the conveyor 6 along the container conveying route of the conveyor 6. The caps 48 are sequentially supplied from a cap supplying unit (not shown) to the cap shoot 50. The supplied caps 48 freely fall so as to slide while being aligned along the cap shoot 50. The caps 48 are conveyed up to the end of the cap shoot 50. At the end of the cap shoot 50, a scratch piece unit 60 is disposed in parallel with the top surface of the frame 4 at a distance from the cap shoot 50. According to the present embodiment, in the scratch piece unit 60, scratch pieces 58 as much as the cap chuck units 36 of the capping head 34, namely, three scratch pieces 58 are disposed.

[0033] The scratch piece unit 60 is moved and operated by a scratch piece conveying mechanism 52. In association with the movement of the scratch piece unit 60, the caps 48 at the end of the cap shoot 50 are hooked and transferred by the three scratch pieces 58, respectively.

[0034] During the operation of the capper 2, the follow-up device 18 is moved so as to follow the container conveying operation of the conveyor 6 from a start position (the left end of each guide shaft 13 in FIG. 2) to an end position (the right end of each guide shaft in FIG. 2) of the work-unit conveying path formed by the pair of guide shafts 13. During the follow-up operation, a work such as attachment of the cap 48 to the container 8 through the chuck portion 40 at the lower end of the cap chuck unit 36 is performed synchronously with the container conveying operation of the conveyor 6.

[0035] Further, when the follow-up device 18 reaches the end position of the work-unit conveying path, the follow-up operation with respect to the container conveying operation of the conveyor 6 is stopped. After that, the follow-up device 18 is driven so as to return in the direction opposite to that of the follow-up operation, so that the device is returned to the end position of the work-unit conveying path. Then, the follow-up operation of the follow-up device 18, in which the follow-up device 18 is conveyed from the start position of the work-unit conveying path to the end position thereof so as to follow the above container conveying operation of the conveyor 6, and the returning operation in which the follow-up device 18 is returned to the start position of the work-unit conveying path after the follow-up operation is stopped at the end position thereof, are alternatively repeated.

[0036] According to the present embodiment, the capper 2 has a capper capacity changing unit 61 and moving stroke changing means 62. The capper capacity changing unit 61 has a function to change the standard number of cap chuck units 36 built in the capping head 34 to change the capacity of the capper 2. The moving stroke changing means 62 has a function to change a moving stroke of the follow-up device 18 in accordance with the number of cap chuck units 36 changed by the capper capacity changing unit 61.

[0037] In this instance, as shown in FIG. 7, the capper capacity changing unit 61 includes a head unit 63 integrating the chuck portion 40 of one cap chuck unit 36, the motor 42 for the cap chuck unit 36, and a power transmitting section therebetween into one. Three head units 63 are connected to each other in line to form the capping head 34 having the standard number of cap chuck units (three units) 36 as shown in FIG. 5.

[0038] The capper capacity changing unit 61 changes the number of cap chuck units 36 built in the capping head 34 from the initially set standard number (three) shown in FIG. 5 to another number so that the capacity of the capper 2 can be changed. For example, when the capacity of the capper 2 is increased, the head units 63 larger than the initially set standard number, e.g., the five head units 63 are connected to each other as shown in FIG. 6. When the number of connected cap chuck units 36 is increased, the moving stroke of the follow-up device 18 is also changed and increased.

[0039] A chuck fixing base 64 of the capping head 34 comprises an attachment plate 65, side plates 66, and a bottom plate 67 as shown in FIG. 8A. In the attachment plate 65 of the chuck fixing base 64, chuck-unit attachment holes 68 are formed at regular intervals L2.

[0040] When the number of cap chuck units 36 built in the capping head 34 is changed (the number of heads is increased), as shown in FIG. 8B, attachment plates 65a and bottom plates 67a are added in the chuck fixing base 64 in accordance with the increased number. In this instance, the chuck units 36 are added and are then attached to the attachment plates 65 and 65a of the chuck fixing base 64. The attachment holes 68 are formed at the regular intervals L2 in the attachment plates 65 and 65a of the chuck fixing base 64. Accordingly, in the case where the number of chuck units 36 is changed from an even number to an odd number or from an odd number to an even number, the rearrangement can be realized so long as the attachment position of each chuck unit 36 is deviated from the original position and each unit 36 is fixed to another position.

[0041] Further, when the number of cap chuck units 36 built in the capping head 34 is reduced, the attachment plate 65a and the bottom plate 67a exclusively used for the reduced cap chuck unit 36 are detached from the chuck fixing base 64, so that the rearrangement can be realized. In the case where the number of heads is reduced, when the remaining cap chuck units 36 are deviated from the original chuck-unit attachment holes 68, the cap chuck units 36 can be fixed to the base without forming another attachment plate 65 and another bottom plate 67.

[0042] The moving stroke of the follow-up device 18 is changed in accordance with a change in the number of cap chuck units 36 built in the capping head 34. In this instance, the moving stroke changing means 62 has the length adjusting means 69 for adjusting the length of the guide shaft 13 in accordance with the length of the moving stroke.

[0043] The length adjusting means 69 for the guide shafts 13 appropriately changes the length of the guide shaft 13 in accordance with a change in the number of cap chuck units 36 built in the capping head 34. At that time, as the guide shaft 13, it is necessary to form a linear shaft having a proper length in accordance with the moving stroke of the follow-up device 18. Since the linear shaft as the guide shaft 13 has marketability, the linear shaft can easily be obtained at low cost. Furthermore, the shaft block 15 can also be used for another purpose.

[0044] The moving stroke changing means 62 has means 70 for adjusting the length of a shaft supporting member and means 71 for adjusting the length of the rack. In this instance, as shown in FIGS. 3 and 4, the shaft-supporting-member length adjusting means 70 has the following configuration. A shaft supporting member 72 for the guide shafts 13 is divided into a plurality of components 73. The number of components 73 to be coupled to each other as the shaft supporting member 72 is changed in accordance with the length of the moving stroke of the follow-up device 18. For example, the number of components 73 to be coupled to each other as the shaft supporting member 72 is changed in accordance with the number of cap chuck units 36 changed by the capper capacity changing unit 61. In a case where the moving stroke of the follow-up device 18 is set in a standard state that moving stroke is relatively short, the three components 73 are coupled to each other as the shaft supporting member 72 as shown in FIG. 3. In this state, the moving stroke changing

means 62 is set so that the moving stroke of the follow-up device 18 in the standard state is held.

[0045] Further, when the moving stroke of the follow-up device 18 is larger than that of the standard state, the moving stroke changing means 62 is set as shown in FIG. 4. In this case, the number of components 73 to be coupled to each other as the shaft supporting member 72 is increased. For example, the four components 73 are coupled to each other as the shaft supporting member 72. In this state, the moving stroke of the follow-up device 18 longer than that in the standard state is maintained. In a frame of each shaft-supporting-member component 73, attachment holes 74 are formed at regular intervals L1 in a manner similar to the case of the attachment plate 65 of the chuck fixing base 64.

[0046] The rack length adjusting means 71 has the following configuration as shown in FIGS. 3 and 4. The rack 12 is divided into a plurality of components 75. The number of rack components 75 to be coupled to each other is changed in accordance with the length of the moving stroke of the follow-up device 18. For example, the number of rack components 75 to be coupled to each other is changed in accordance with the number of cap chuck units 36 changed by the capper capacity changing unit 61. When the moving stroke of the follow-up device 18 is in the standard state in which the moving stroke is relatively short, for example, the three rack components 75 are coupled to each other as shown in FIG. 3. When the moving stroke of the follow-up device 18 is larger than that in the standard state, for example, the four rack components 75 are coupled to each other as shown in FIG. 4. The tooth and the length at the end of the rack 12 are managed. The rack 12 is then attached to the shaft-supporting-member components 73.

[0047] When the number of cap chuck units 36 built in the capping head 34 is increased, the intermediate shaft-supporting-member component 73 having the rack component 75 is added and the resultant shaft supporting member is attached to the frame. In this instance, the attachment holes 74 are formed at regular intervals in the frame of the intermediate shaft-supporting-member component 73. Accordingly, in the case where the number of intermediate shaft-supporting-member components 73 is changed from an even number to an odd number or from an odd number to an even number, when the attachment position of each component 73 is deviated from the original position and each component 73 is fixed to another position, the rearrangement can be performed.

[0048] The intermediate shaft-supporting-member component 73 is formed so that the length thereof is managed. Accordingly, the intermediate shaft-supporting-member components 73 are fixed so that the end surfaces of the components 73 face to each other, so that each distance between the rack components 75 has an appropriate value.

[0049] When the number of cap chuck units 36 built in the capping head 34 is reduced, the number of intermediate shaft-supporting-member components 73 is reduced to form the short linear shaft. Consequently, the rearrangement can be performed. In the case where the long moving stroke of the follow-up device 18 may not be used, there is no time before rearrangement, or it is desired that the cost for rearrangement be reduced, the original guide shaft 13 can be cut and then used.

[0050] In the above configuration, the following advantages are obtained. That is, according to the present embodiment, when the capacity of the capper 2 is changed, the capper capacity changing unit 61 changes the number of cap chuck units 36 included in the follow-up device 18, thereby changing the capacity of the capper 2. Furthermore, the moving stroke changing means 62 of the capper capacity changing unit 61 changes the moving stroke of the follow-up device 18 in accordance with the number of cap chuck units 36. Accordingly, a container follow-up type packaging machine such as a filler or a capper can have versatility during changing the capacity and can be adapted in accordance with the increase or decrease in the number of cap chuck units 36 built in the capping head 34.

[0051] Consequently, in a case where the capacity of any one of a plurality of processing stations (machines) on the product manufacturing line does not satisfy desired throughput due to a change in material (liquid to be packed, the shape of a cap, or the properties of the material) after installation, the capacity of such a machine having low throughput can easily be increased. Therefore, as compared with a conventional case where a container transfer speed on the product manufacturing line is set in accordance with the capacity of a machine having low throughput, the processing speed of the overall product manufacturing line is raised, so that the throughput can be raised. Consequently, as compared with the conventional system, the work efficiency of the whole product manufacturing line can be raised.

[0052] According to the present embodiment, while the moving stroke changing means 62 performs the operation to change the moving stroke of the follow-up device 18 in accordance with the number of cap chuck units 36 built in the capping head 34, the length adjusting means 69 for the guide shafts 13 adjusts the length of the guide shaft 13 in accordance with the length of the moving stroke. Furthermore, the shaft-supporting-member length adjusting means 70 changes the number of components 73 coupled to each other as the shaft supporting member 72 in accordance with the length of the moving stroke. Moreover, the rack length adjusting means 71 changes the number of rack components 75 to be coupled to each other in accordance with the length of the moving stroke. Consequently, in the whole container follow-up type capper system, the capacity of the machine alone having low throughput can be raised.

[0053] Further, according to the present embodiment, the driving system of the follow-up device 18 includes the rack and opinion system driving mechanism having the engagement between the rack 12 and the pinion

gear 14. Consequently, when the moving stroke of the follow-up device 18 is changed, the moving stroke can be changed by merely adding the component 75 constituting the rack 12. Accordingly, when the moving stroke is changed, it is unnecessary to replace all of the threads in the same way as the case where the ball thread is used in the driving system of the follow-up device 18. Consequently, the moving stroke of the follow-up device 18 can easily be changed, so that the changing operation can immedia tely be performed at a work site.

[0054] FIGS. 9 to 12B illustrate a system according to a second embodiment of the present invention. The present embodiment shows a modification of the moving stroke changing means 62 for changing the moving stroke of the follow-up device 18 in the capper 2 according to the first embodiment (refer to FIGS. 1 to 8B).

[0055] That is, according to the present embodiment, the system includes a swing lever 83 which can be swung around a rotating shaft 82 such as an oscillating drive attached to a driving base 81 of the capper 2. The swing lever 83 has a plurality of positioning holes 84 in the radial direction. Further, a link arm 85 is rotatably coupled to one of the positioning holes 84 of the swing lever 83 through a coupling pin 8 6. The link arm 85 has a plurality of coupling holes 87 in line in the axial direction of the arm.

[0056] As shown in FIG. 10, the link arm 85 is rotatably coupled to the follow-up device 18. In association with the swinging operation of the swing lever 83 around the rotating shaft 82, the follow-up device 18 is linearly reciprocated along the pair of guide shafts 13 through the link arm 85. Consequently, a driving mechanism 88 for linearly reciprocating the follow-up device 18 along the pair of guide shafts 13 is formed. In this instance, while the follow-up device 18 is linearly reciprocated along the guide shafts 13, the moving stroke of the follow-up device 18 is set by the swinging operation of the swing lever 83 around the rotating shaft 82 and the rotating operation of the link arm 85 through the coupling pin 86.

[0057] In the driving mechanism 88, a position at which the positioning hole 84 of the swing lever 83 is coupled to the coupling hole 87 of the link arm 85 is changed. Consequently, it is possible to change the moving stroke of the follow-up device 18 during the linear reciprocation of the follow-up device 18 along the guide shafts 13. For example, the coupling hole 87 at one end of the link arm 85 is coupled to the positioning hole 84 at the distal end of the swing lever 83. Consequently, the moving stroke of the follow-up device 18 can be changed to the maximum moving stroke as shown in FIG. 11.

[0058] FIG. 11 illustrates the moving stroke of the follow-up device 18 on the basis of the driving base 81 of the capper 2 as a reference. Since the follow-up device 18 cannot actually be moved in the direction perpendicular to the moving direction of the follow-up device 18, it is necessary to deviate the driving base 81 of the capper 2.

[0059] As a driving source for the swing lever 83 in the driving mechanism 88 according to the present embodiment, a driving motor 89 is mainly used. In stead of the driving motor 89, the system can include a belt-driving type driving mechanism 95 having the following configuration. In the driving mechanism 95, a driving force, which is transmitted from a counter shaft 90 of the container follow-up type packaging machine to each processing station, is transmitted to a timing pulley 91 and is further transmitted to a timing pulley 94 though a timing belt 93. The driving force is used as a driving source for the swing lever 83 of the driving mechanism 88. Furthermore, in the belt-driving type driving mechanism 95, when the position of a timing pulley 92 is moved as shown in FIGS. 12A and 12B, proper tension can be applied to the timing belt 93 without replacing the timing belt 93.

[0060] FIG. 13 illustrates a system according to a third embodiment of the present invention. The present embodiment relates to an electrical control circuit in a container follow-up type packaging machinery system having a rinser 101, a filler 102, and a capper 103 in parallel with the conveying direction of the container 8 by the conveyor 6 according to the first embodiment (refer to FIGS. 1 to 6). Referring to FIG. 13, reference numeral 104 denotes a main driving unit (main unit) serving as the main of the container follow-up type packaging machinery system. According to the present embodiment, a conveyor 105 is set as a main shaft. The main driving unit 104 includes a conveyor driving motor 106, a conveyor driving pulley 107 fixed to a rotating shaft of the driving motor 106, a resolver 108, and a programmable logic controller (PLC: a sequencer) 109.

[0061] Further, each sub unit such as the rinser 101, filler 102, or capper 103 has the PLC 109 therein. The sub units such as the rinser 101, filler 102, and capper 103 and the main driving unit 104 are connected to each other through four cables 110 to 113. The first cable 110 is a cable through which a rotation signal is transmitted from the resolver attached to the conveyor driving shaft. The second cable 111 is a power supply cable of, for example, three-phase AC 200V according to the present embodiment. The third cable 112 connects the PLCs 109 built in the respective units to form a network. The fourth cable 113 is a cable through which a mechanical timing signal and a signal from an emergency stop button or a door safety switch are transmitted.

[0062] The operation comprising the following steps is performed during the operation of the container follow-up type packaging machinery system according to the present embodiment.

1. (1) A control unit and a device for supplying (2) a sync signal are mounted on the main driving unit 104 (main conveyor device) to distribute a signal to each processing station. In this instance, (1) each processing station is operated synchronously with the sync signal supplied from the main driving unit

104. (2) Each processing station is driven by a signal from the main driving unit 104.

2. The control units of the respective processing stations are connected in a manner similar to the main unit. Accordingly, (1) even when the processing station constituting the container follow-up type packaging machinery system is replaced to another one, the main driving unit 104 need not modifying because each processing station is connected through the same interface (both of software and hardware). (2) Since the signals transmitted from the respective processing stations to the main driving unit 104 have the same form, any processing station constituting the system can operate or monitor the system. (3) Since the processing stations constituting the system are connected by the cables alone, the processing stations can be increased or removed through the cables.

3. Since a cam servo is mounted, the cam can be changed in a programmable manner. Consequently, (1) even when the number of heads in the processing station constituting the system is increased or reduced in a built-in manner, the increase or decrease can be realized by merely replacing cam data to another one without changing the control unit. (2) For changing the operation moving stroke based on a change in work, the operation moving stroke can easily be reset in a teaching manner.

4. Since a handy terminal display is used, during adjustment, the display can be connected to each processing station to operate the processing station.

5. Various optional functions can be connected to the main unit . (1) The operation, the suspension, and the small movement adjusting operation can be performed using a wireless remote controller. (2) Production information data can be transmitted to high level units (serial transmission, MELSECNET, Ethernet, etc) . (3) A remote debug modem can be connected through a telephone line. (4) Abnormal information and notice or designation regarding a material to be supplied can be performed by connecting an FA pager unit.

[0063] Accordingly, each processing station can be adjusted solely, production can be started just after a line is built. When the configuration of the line is changed, the operation can be performed only by connecting line components again. It is unnecessary to modify the control unit or change the program. Changing the configuration can be completed in short time.

[0064] On the other hand, in a case where a plurality of processing stations are connected using a mechanical driving unit to constitute a line in a manner similar to a conventional system as shown in FIG. 14, generally, the whole line is controlled simultaneously. In this case, when the line configuration is changed, namely, the processing station is replaced to another one or the processing station is increased or removed, it is necessary to modify the control unit or rearrange cables because of the change in the line configuration.

[0065] When a new processing station is added in an electronic synchronizing manner, a signal is extracted from the existing processing station just before the addition to synchronize the processing station. However, when a processing station is added or removed to/from the intermediate portion of the line configuration, in order to change the processing stations to be synchronized to each other, it is necessary to reconstitute the line and rearrange the cables.

[0066] As mentioned above, in any case, it is necessary to modify the control unit, rearrange the cables, and correct a program in accordance with the reconstitution of the line. Consequently, it is necessary to extensively modify the control. Modifying requires much time and cost.

[0067] The system according to the third embodiment has the following advantages. That is, according to the present embodiment, each processing station can be adjusted solely so long as the processing station is set with the conveyor device. Consequently, as long as each processing station is adjusted solely, production can be started just after the line is built. When the line configuration is changed, the line can be operated only by again connecting the processing stations. It is unnecessary to modify the control unit or change the program. Changing the configuration is completed in short time.

[0068] Furthermore, according to the present embodiment, the following advantages are obtained.

1. Since each processing station can be adjusted solely, the production starts more rapidly after the processing stations are assembled into one line.
2. When the line configuration is changed, it is unnecessary to change the control for each of the processing stations.
3. Accordingly, the processing stations can easily be increased or reduced on the line after installation without changing the existing control.

Claims

1. A container follow-up type packaging machinery system in which a plurality of processing stations (2, 101, 102, 103) which perform various packing processings to containers (8) serving as a packing processing target are arranged along a container conveying path of a container conveying device (6, 105) which conveys the containers (8), and a follow-up device (18) which moves so as to follow the containers (8)conveyi ng operation of the container conveying device (6, 105) is provided for each processing station (2, 101, 102, 103), **characterized by** further including

a work unit assembly (34), in which a plurality of work units (36) which perform the various packing processings to the containers (8) are linearly arranged along the container conveying direction of the container conveying device (6, 105), is provided for at least one of the processing stations (2, 101, 102, 103),

a processing-station capacity changing unit (61) which changes the capacity of the processing station (2, 101, 102, 103) by changing the number of work units (36) included in the work unit assembly (34), and

the processing-station capacity changing unit (61) including moving stroke changing portion (62) which changes moving stroke of the follow-up device (18) in accordance with the number of work units (36).

2. The system according to claim 1, **characterized in that**

the processing station (2) including the work unit assembly (34) has a guide shaft (13) which extends along the container conveying direction of the container conveying device (6) to guide the movement of the follow-up device (18) , a shaft supporting member (72) which supports the guide shaft (13), and a rack (12) which extends along the container conveying direction of the container conveying device (16),

the follow-up device (18) has a bearing portion (15) which is slidably connected to the guide shaft (13), a pinion gear (14) which is engaged with the rack (12), and a driving motor (16) which drives the pinion gear (14), and

the moving stroke changing portion (62) has guide-shaft length adjusting portion (69) which adjusts the length of the guide shaft (13) in accordance with the length of the moving stroke, shaft-supporting-member length adjusting portion (70) which comprises a plurality of shaft-supporting-member components (73) to be coupled to each other to constitute the shaft supporting member (72) and which changes the number of shaft-supporting-member components (73) to be coupled in accordance with the length of the moving stroke, and rack length adjusting portion (71) which comprises a plurality of rack components (75) to be coupled to each other to constitute the rack (12) and which changes the number of rack components (75) in accordance with the length of the moving stroke.

Patentansprüche

1. Folgesystem für Behälter in einer Verpackungsmaschine, in welchem eine Mehrzahl von Verarbeitungsstationen (2, 101, 102, 103), welche verschiedene Verpackungsvorgänge an Behältern (8) durchführen, welche als ein Verpackungsbearbeitungsobjekt dienen, entlang eines Behälterförderweges einer Behälterfördervorrichtung (6, 105) , welche die Behälter (8) befördert, angeordnet ist und eine Folgevorrichtung (18), welche sich bewegt, um der Behälter (8)-Förderoperation der Behälterfördervorrichtung (6, 105) zu folgen, für jede Verarbeitungsstation (2, 101, 102, 103) vorgesehen ist, **dadurch gekennzeichnet, dass** es ferner umfasst:

eine Arbeitseinheitsgruppe (34), welche für wenigstens eine der Verarbeitungsstationen (2, 101, 102, 103) vorgesehen ist und in welcher eine Mehrzahl von Arbeitseinheiten (36), welche die verschiedenen Verpackungsvorgänge an den Behältern (8) durchführen, entlang der Behälterförderrichtung der Behälterfördervorrichtung (6, 105) linear angeordnet ist,

eine Einheit (61) zur Änderung der Verarbeitungsstationskapazität, welche die Kapazität der Verarbeitungsstation (2, 101, 102, 103) durch Ändern der Anzahl der Arbeitseinheiten (36), die in der Arbeitseinheitsgruppe (34) enthalten sind, ändert, und

wobei die Einheit (61) zur Änderung der Verarbeitungsstätionskapazität einen Fahrwegänderungsabschnitt (62) umfasst, welcher einen Fahrweg der Folgevorrichtung (18) gemäß der Anzahl der Arbeitseinheiten (36) ändert.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verarbeitungsstation (2), welche die Arbeitseinheitsgruppe (34) umfasst, eine Führungswelle (13), welche sich entlang der Behälterförderrichtung der Behälterfördervorrichtung (6) erstreckt, um die Bewegung der Folgevorrichtung (18) zu führen, ein Wellenaufnahmeelement (72), welches die Führungswelle (13) aufnimmt, und eine Zahnstange (12), welche sich entlang der Behälterförderrichtung der Behälterfördervorrichtung (6) erstreckt, aufweist,
die Folgevorrichtung (18) einen Lagerabschnitt (15), welcher mit der Führungswelle (13) verschiebbar verbunden ist, ein Antriebsritzel (14), welches mit der Zahnstange (12) in Eingriff ist, und einen Antriebsmotor (16), welcher das Antriebsritzel (14) antreibt, aufweist und
der Fahrwegänderungsabschnitt (62) einen Führungswellenlängeneinstellabschnitt (69), welcher die Länge der Führungswelle (13) gemäß der Länge des Fahrweges einstellt, einen Abschnitt (70) zum Einstellen der Wellenaufnahmeelementlänge, welcher eine Mehrzahl von Wellenaufnahmeelementkomponenten (73) umfasst, welche aneinander zu koppeln sind, um das Wellenaufnah-

meelement (72) zu bilden, und welcher die Anzahl der aneinander zu koppelnden Wellenaufnahmeelementkomponenten (73) gemäß der Länge des Fahrwegs ändert, und einen Zahnstangenlängeneinstellabschnitt (71), welcher eine Mehrzahl von Zahnstangenkomponenten (75) umfasst, welche aneinander zu koppeln sind, um die Zahnstange (12) zu bilden, und welcher die Anzahl der Zahnstangenkomponenten (75) gemäß der Länge des Fahrwegs ändert.

Revendications

1. Système de suivi pour des conteneurs dans des machines d'emballage dans lequel une pluralité de stations de traitement (2, 101, 102, 103) qui effectuent divers traitements d'emballages sur les conteneurs (8) servant de cibles de traitement d'emballage sont disposées le long d'un passage de transport des conteneurs d'un dispositif de transport des conteneurs (6, 105) qui transporte les conteneurs (8), et un dispositif de suivi (18) qui se déplace de manière à suivre l'opération de transport des conteneurs (8) du dispositif de transport des conteneurs (6, 105) est fourni pour chaque station de traitement (2, 101, 102, 103), **caractérisé en ce qu'**il comprend en outre :

un ensemble d'unités de travail (34), dans lequel une pluralité d'unités de travail (36) qui effectuent les divers traitement d'emballage sur les conteneurs (8) sont disposées de manière linéaire le long de la direction de transport du conteneur du dispositif de transport des conteneurs (6, 105), est prévu pour au moins une des stations de traitement (2, 101, 102, 103) ;
une unité de modification de la capacité de la station de traitement (61) qui modifie la capacité de la station de traitement (2, 101, 102, 103) en modifiant le nombre d'unités de travail (36) incluses dans l'ensemble d'unités de travail (34) ; et
l'unité de modification de la capacité de la station de traitement (61) comprenant une portion de modification de l'amplitude de déplacement (62) qui modifie l'amplitude de déplacement du dispositif de suivi (18) en fonction du nombre d'unités de travail (36).

2. Système selon la revendication 1, **caractérisé en ce que** :

la station de traitement (2) comprenant l'ensemble d'unités de travail (34) a un arbre de guidage (13) qui s'étend le long de la direction de transport des conteneurs du dispositif de transport des conteneurs (6) pour guider le mouvement du dispositif de suivi (18), un élément de support d'arbre (72) qui soutient l'arbre de guidage (13) et une grille (12) qui s'étend le long de la direction de transport des conteneurs du dispositif de transport des conteneurs (16) ;
le dispositif de suivi (18) a une portion de support (15) qui est reliée de manière coulissante à l'arbre de guidage (13), un engrenage à pignons (14) qui vient en prise avec la grille (12) et un moteur d'entraînement (16) qui entraîne l'engrenage à pignons (14) ; et
la portion de modification de l'amplitude de déplacement (62) a une portion d'ajustement (69) de la longueur de l'arbre de guidage qui ajuste la longueur de l'arbre de guidage (13) selon la longueur de l'amplitude de déplacement, une portion d'ajustement (70) de la longueur de l'élément de support de l'arbre comprenant une pluralité de composants d'élément de support d'arbre (73) à coupler les uns aux autres pour constituer l'élément de support d'arbre (72) et qui modifie le nombre de composants de l'élément de support d'arbre (73) à coupler en fonction de la longueur de l'amplitude de déplacement, et une portion d'ajustement (71) de la longueur de la grille comprenant une pluralité de composants de grille (75) à coupler les uns avec les autres pour constituer la grille (12) et qui modifie le nombre de composants de grille (75) en fonction de la longueur de l'amplitude de déplacement.

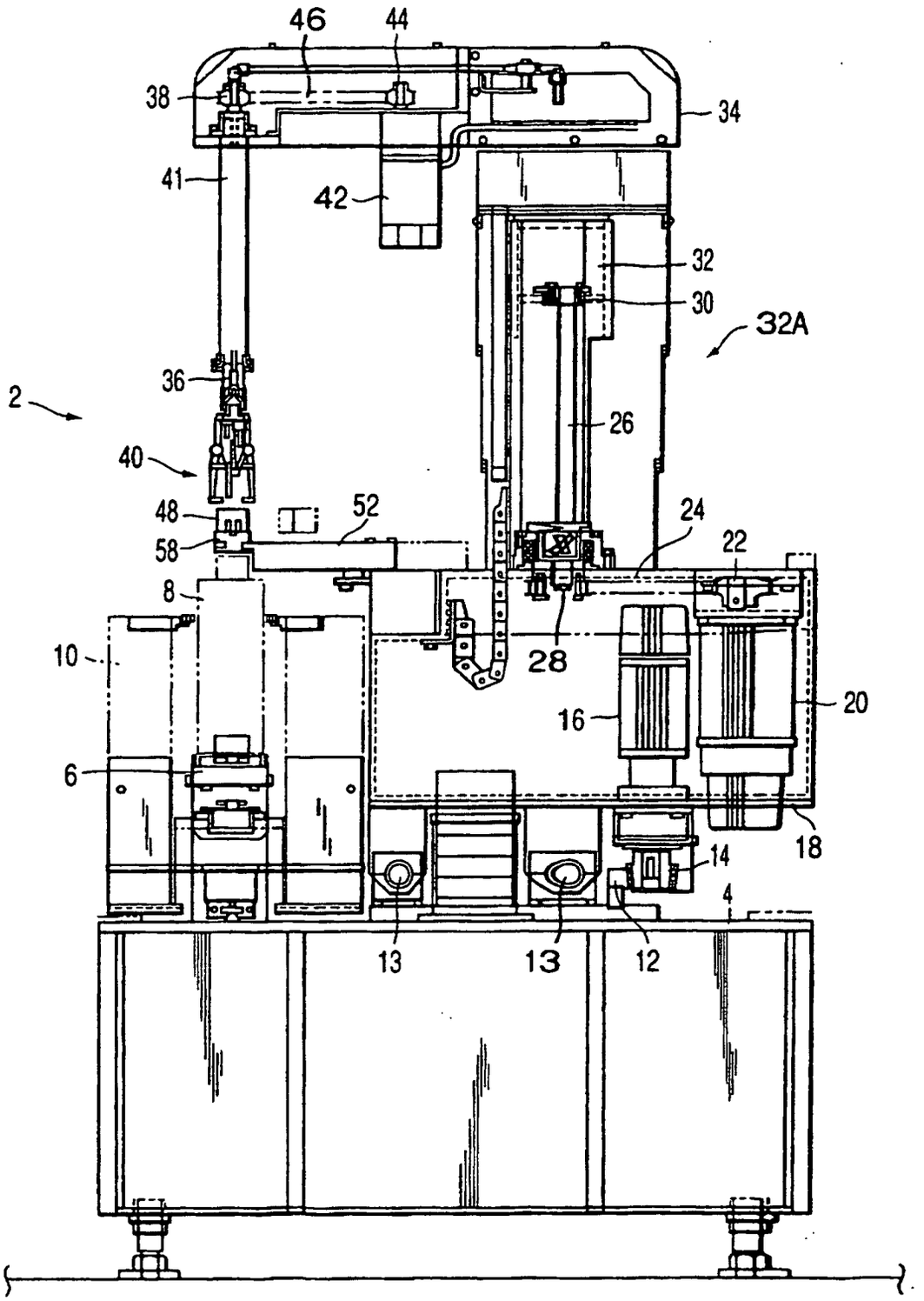

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FIG. 1

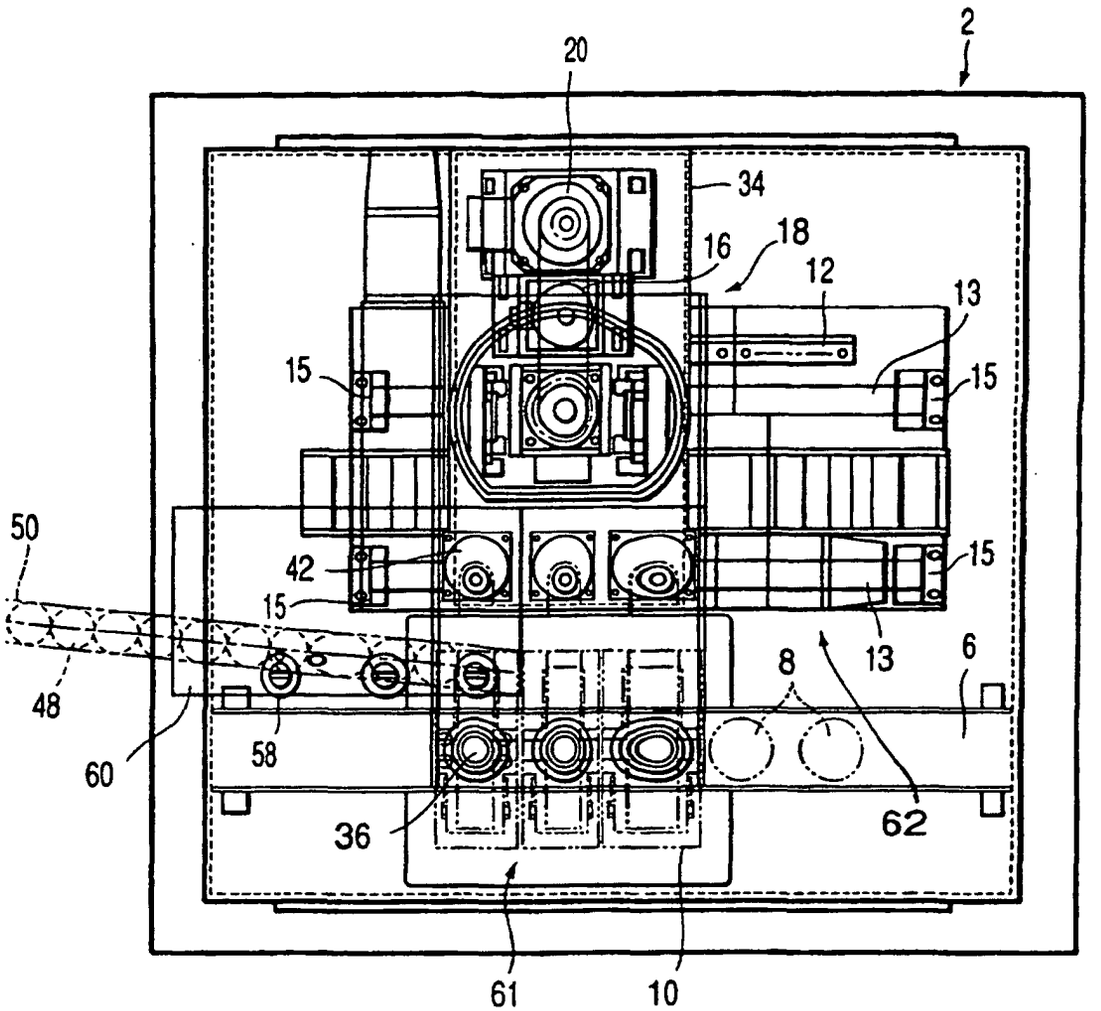


FIG. 2

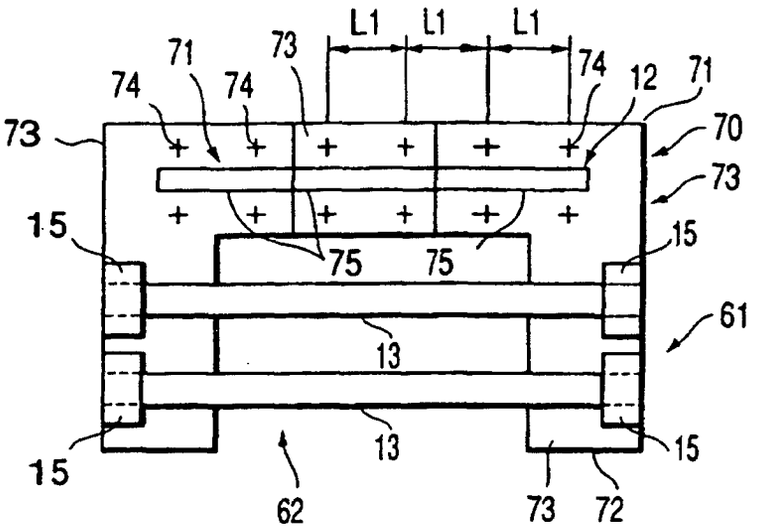

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FIG. 3

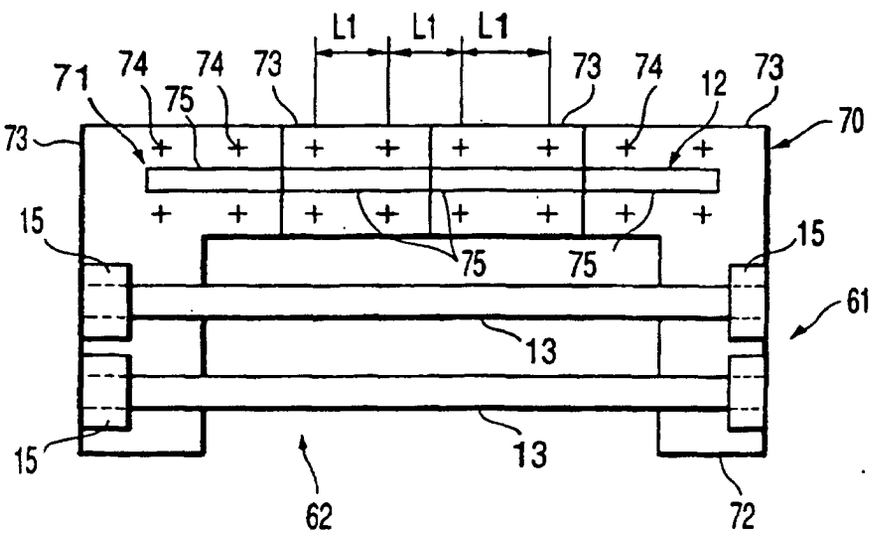

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FIG. 4

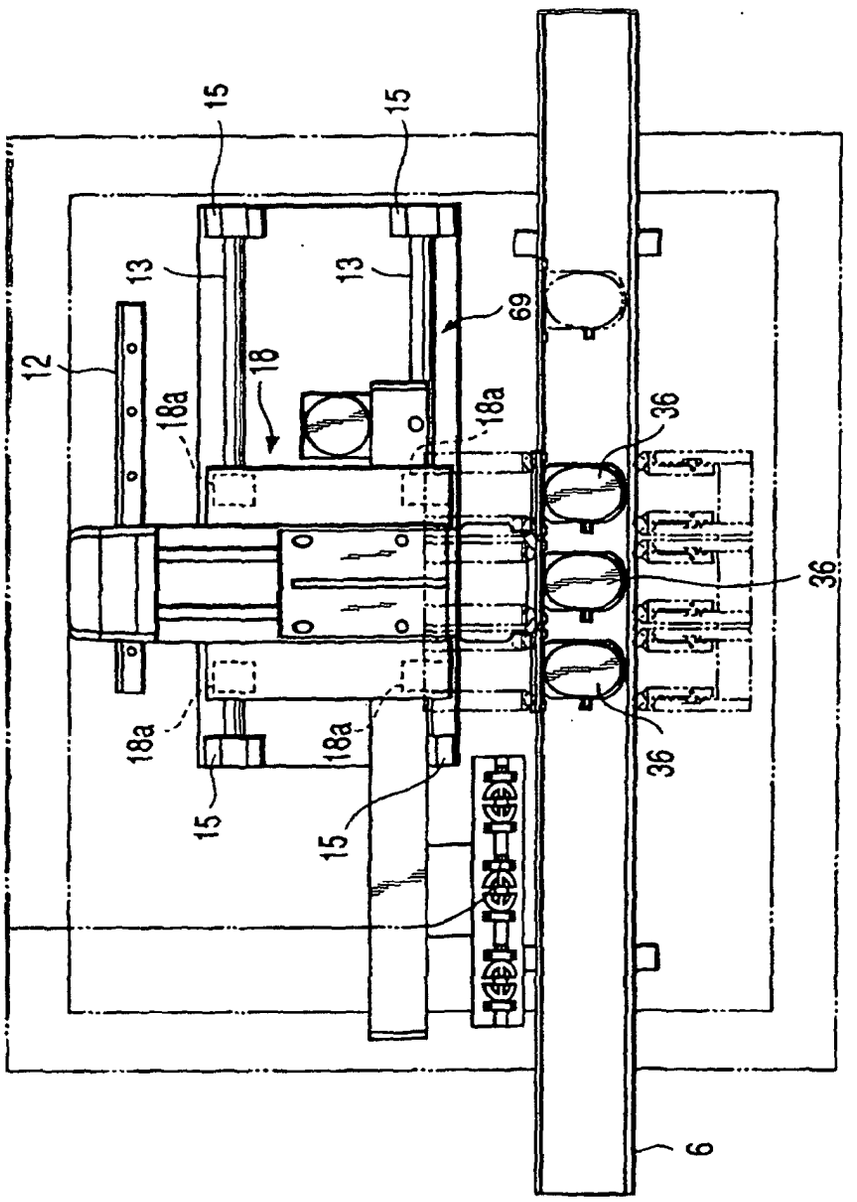


FIG. 5

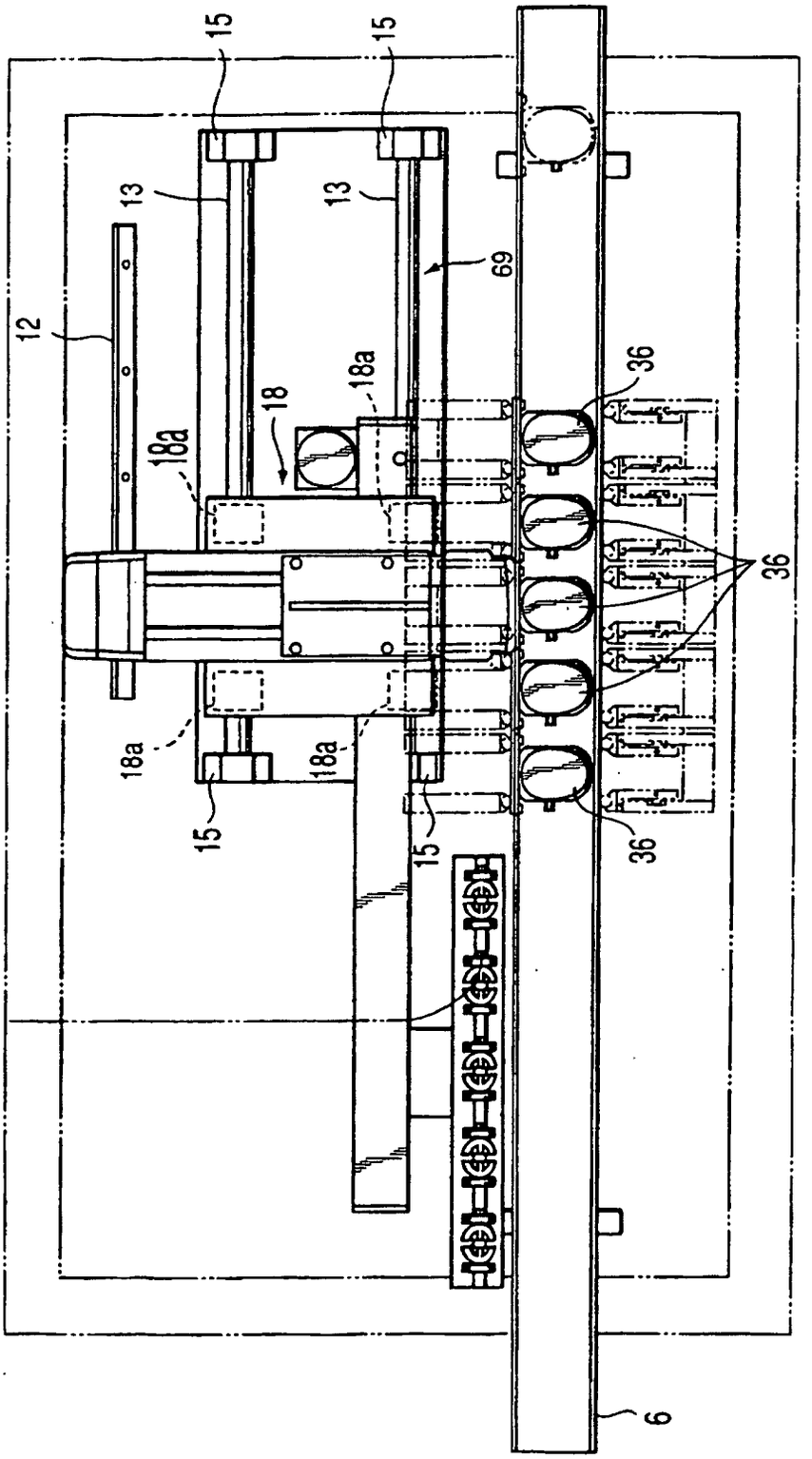


FIG.6

FIG. 7

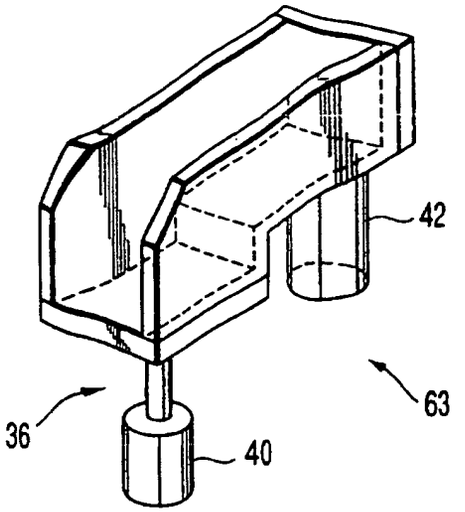


FIG. 8A

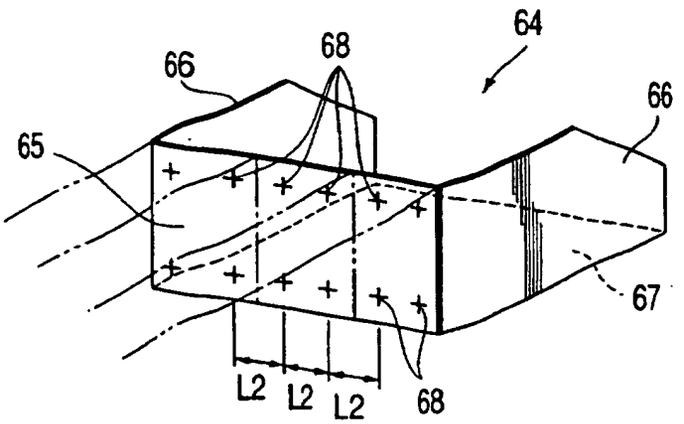
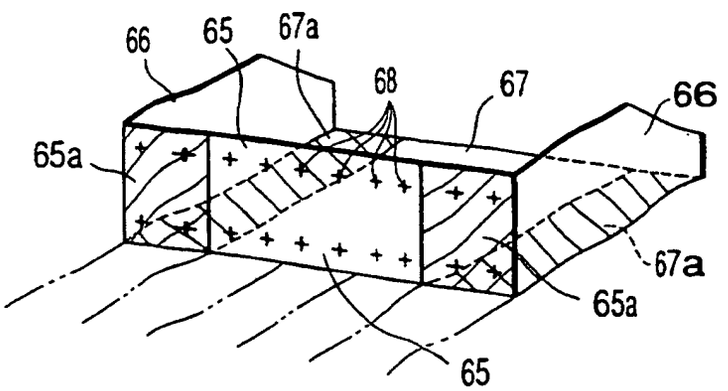


FIG. 8B



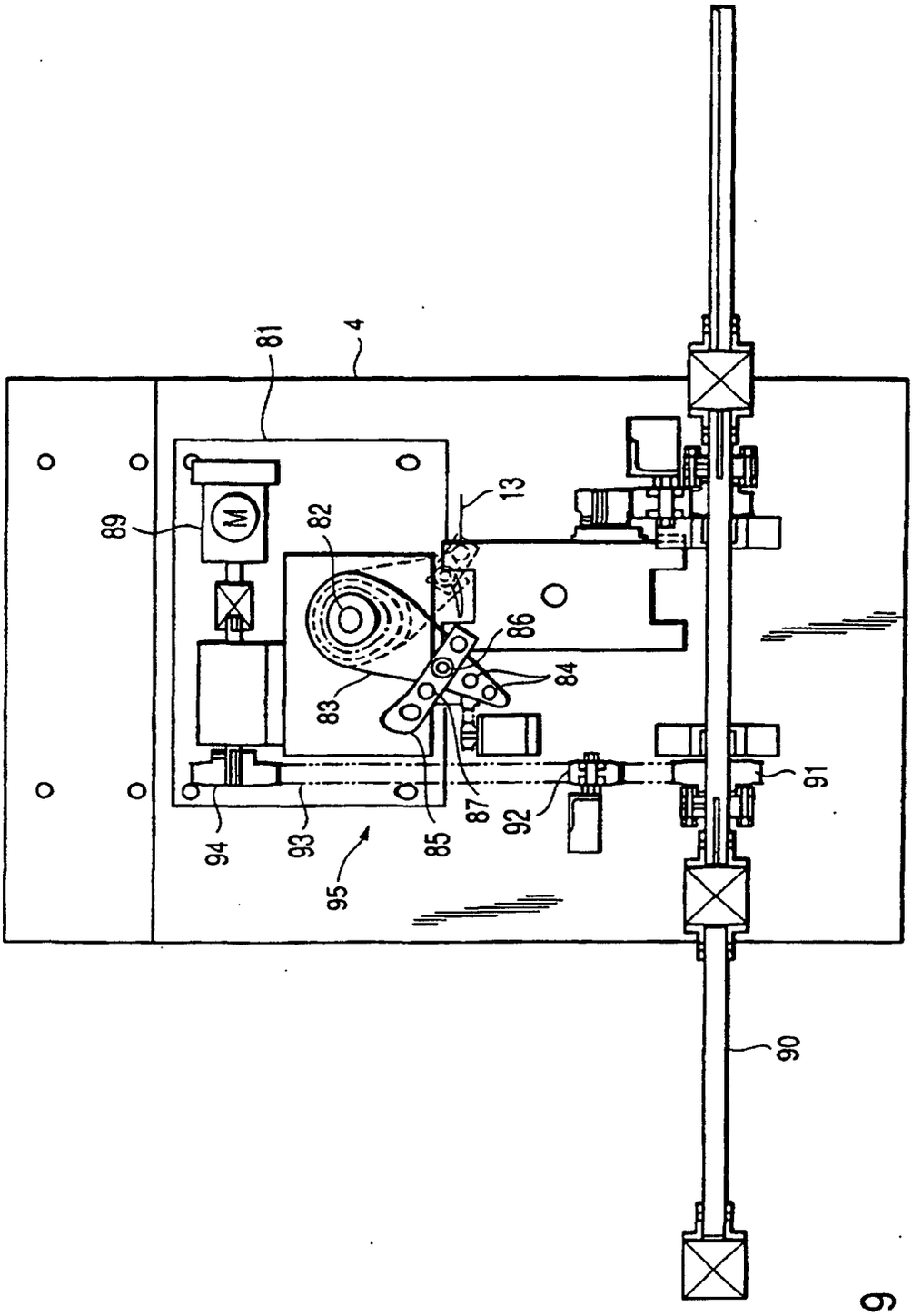


FIG. 9

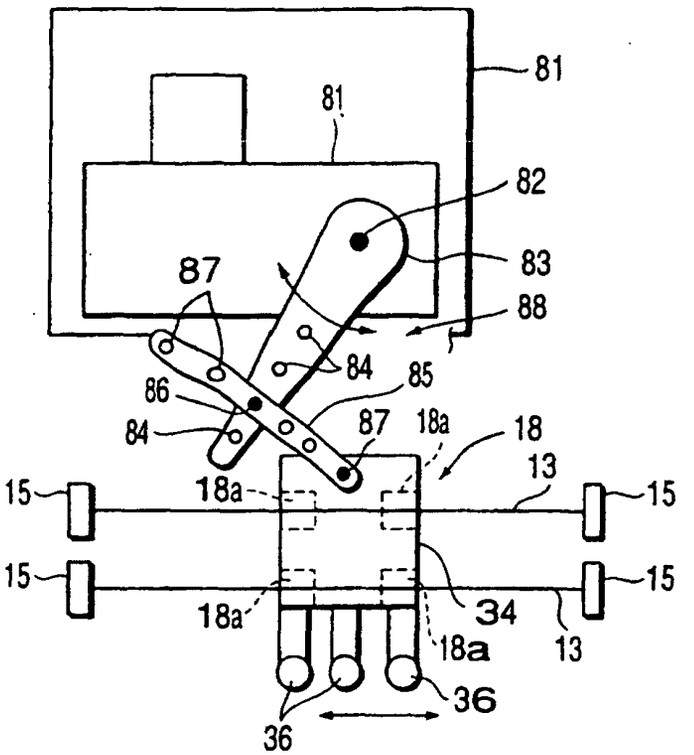

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FIG. 10

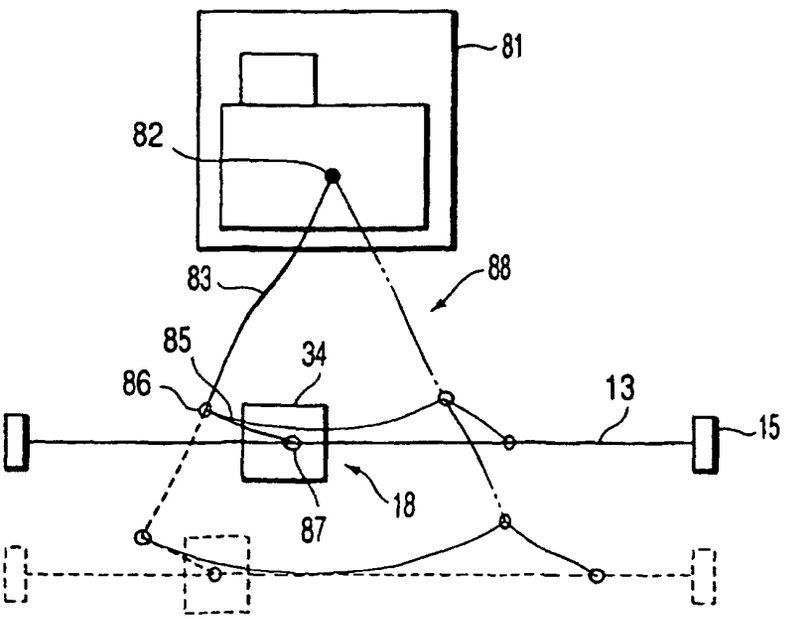

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FIG. 11

FIG. 12A

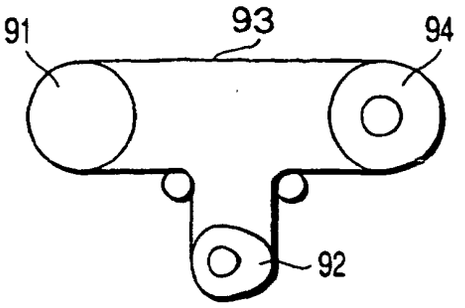
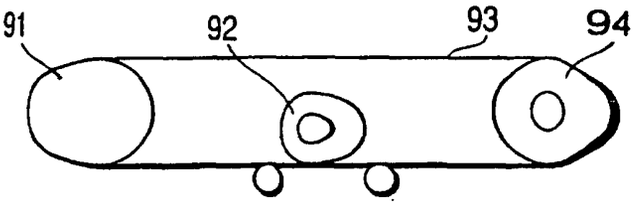


FIG. 12B



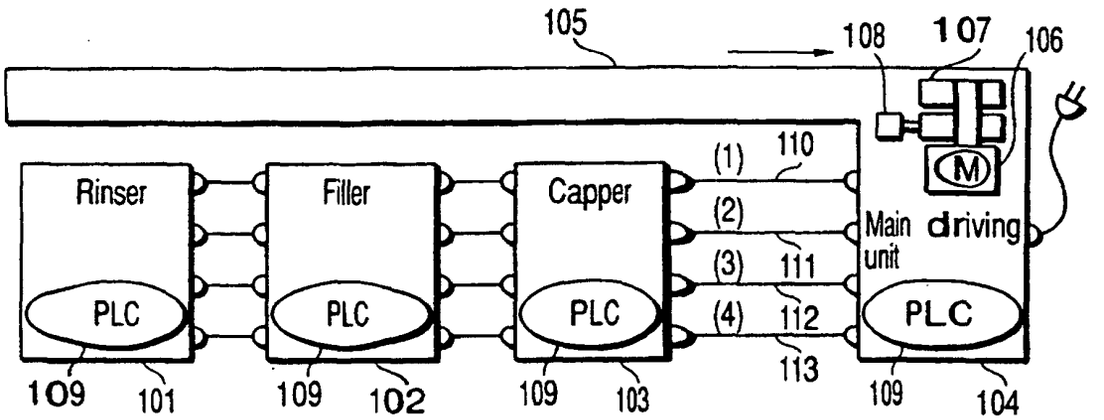


FIG. 13

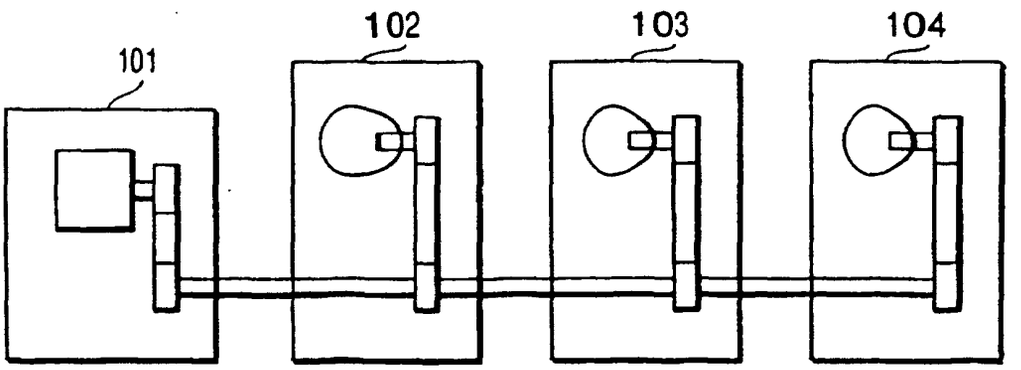


FIG. 14 PRIOR ART