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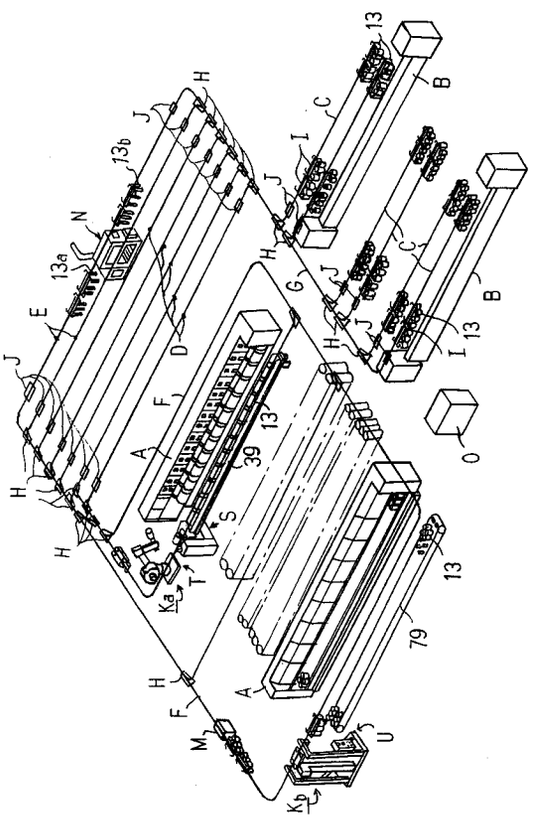
(54) Automatic roving conveying apparatus for textile machines.

(57) Full roving bobbins 13 produced by a flyer frame A are automatically mounted in magazines I for a first connection rail F by bobbin mounting mechanisms Ka, Kb, Kc. The magazines I are then automatically conveyed from the first connection rail F to a stock rail D by an automatic conveying tow vehicle M and then from the stock rail D to a fine spinning frame rail C by a magazine driving mechanism J. Empty bobbins 13a produced in a fine spinning frame B are automatically conveyed from the fine spinning frame rail C to the standby rail E by the magazine driving mechanism J.

FIG 1



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Recently, the feeding of roving bobbins to fine spinning frames is effected as follows: A hanger rail is installed along and above each fine spinning frame and a magazine is suspended from this hanger rail for traveling, while a plurality of (for example, 6) roving bobbins are rotatably suspended in said magazine through bobbin holders. And this hanger rail is connected to the flyer frame side and roving bobbins produced by the flyer frame are once stored in a stock yard while they are suspended in the magazines, from which stock yard they are then conveyed to fine spinning frames. The magazine conveyed to each fine spinning frame is stopped at a fixed position and the roving bobbins suspended therein are fed at their initial ends to the spindles of the fine spinning frame without being removed from the magazine, the feeding of the rovings being continued in this state until they are exhausted. When the rovings are exhausted, the empty bobbins are carried out of the fine spinning frame while they are suspended in the magazine. When the empty bobbins reach a recovering section, they are removed from the bobbin holders in the magazine and recovered. The recovered empty bobbins are fed to flyer frames to have rovings wound therearound, whereby full roving bobbins are produced. On the other hand, empty magazines are conveyed to the roving frame side to have full roving bobbins, produced by the flyer frame, mounted therein, and then conveyed to the stock yard or fine spinning frame. In addition, a required number of magazines are connected together in order to simultaneously exchange the roving bobbins corresponding in number to all spindles of each fine spinning frame (for example, 400 - 900 spindles on one side).

Heretofore, the carrying-in of roving bobbins to a fine spinning frame and the carrying-out of empty bobbins have been effected by an operator manually pushing along a hanger rail a magazine train consisting of a plurality of magazines having the roving bobbins corresponding in number to all spindles of one fine spinning frame. Further, the mounting operation of suspending full roving bobbins, produced by the flyer frame, from the bobbin holders of the magazines has also been performed by the operator manually lifting them.

Recently, the introduction of high speed fine spinning frames has led to an increase in the weight of roving to be wound per bobbin, and the number of fine spinning frames and the number of all spindles have also increased. As a result, the operation of manually lifting full roving bobbins produced by a flyer frame and mounting them on the bobbin holders of magazines has put a heavy labor burden on the operator; thus, automation and labor saving have been required.

An object of the present invention is to satisfy the above requirement.

To achieve the above object, one form of the invention comprises a plurality of fine spinning frame rails disposed along a fine spinning frame, a plurality of stock rails for full roving bobbins and standby rails for empty bobbins spaced from the fine spinning frame rails, a plurality of magazine rows individually removably supporting the same number of bobbins as the spindles of a single fine spinning frame and connected in a line and supported for traveling on said rails, bobbin mounting mechanisms for automatically mounting in a magazine full roving bobbins produced by a flyer frame, a first connection rail extending from the bobbin mounting mechanism to the stock rail and standby rail through point switching mechanism, a second connection rail for connecting the stock rail and standby rail to the respective fine spinning frame rails through the point switching mechanisms, an automatic conveying tow vehicle capable of forward and reverse drive supported for traveling on the first connection rail alone or on the first and second connection rails and adapted to pull or extrude magazine rows one by one, and magazine driving mechanisms respectively disposed at the gateway of each fine spinning frame, the gateway of each stock rail and the gateway of each standby rail and movable into contact with and away from the magazines and arranged such that during contact, each magazine driving mechanism contacts one or more magazines astride the latter to drive the magazine row.

Further, another form of the invention includes means for removing the residual yarns from the empty bobbins of the magazine row carried out of the fine spinning frame, and means for removing empty bobbins from the magazines.

The bobbin mounting mechanism of the present invention mentioned above comprises a magazine positioning mechanism for successively positioning empty magazine rows, starting with the foremost one, on the first connection rail and intermittently feeding them at a fixed pitch, a conveyor for conveying full roving bobbins produced by a roving frame from the flyer frame to a position below the magazine positioning mechanism, a bobbin positioning mechanism for separating each full roving bobbin from the following ones at the terminal end of said conveyor and positioning them, and a multi-axis robot for successively mounting full roving bobbins positioned by the bobbin positioning mechanism in the magazines positioned by the magazine positioning mechanism.

Further, the bobbin mounting mechanism of the present invention comprises a magazine positioning mechanism for successively positioning empty magazine rows, starting with the foremost

one, on the first connection rail and intermittently feeding them at a fixed pitch, a lifter liftably positioned immediately below said positioning mechanism and adapted to position thereon the same number of full roving bobbins at the same pitch as the bobbins mounted in a single magazine and simultaneously mount a plurality of said positioned and carried full roving bobbins in a single magazine during lifting movement, and a conveyor for conveying full roving bobbins produced by a flyer frame from the flyer frame to the position of the lifter.

Further, the bobbin mounting mechanism of the present invention comprises a magazine positioning mechanism for successively positioning empty magazine rows, starting with the foremost one, on the first connection rail and intermittently feeding them at a fixed pitch, a pallet for removably positioning thereon the same number of full roving bobbins at the same pitch as the the bobbins mounted in a single magazine, a carriage for removably positioning and carrying said pallet, an automatic conveying tow vehicle of the ground traveling type adapted to move a plurality of said carriages connected together between a position below said magazine positioning mechanism and a plurality of flyer frames, a lifter positioned immediately below said magazine positioning mechanism and adapted to successively position the pallets, starting with the foremost one, carried on said automatic conveying tow vehicle to the position immediately blow said magazine positioning mechanism and lift the pallets alone from the carriage to simultaneously mount a plurality of full roving bobbins on the pallet in a single magazine.

Further, the present invention is characterized in that any one of the three bobbin mounting mechanism mentioned above is used as the means for removing empty bobbins from the magazines.

Full roving bobbins produced by a flyer frame are automatically conveyed to the position of a bobbin mounting mechanism by a conveyor or an automatic conveying tow vehicle of the ground traveling type. And the full roving bobbins are automatically mounted in the magazines. The magazine row having full roving bobbins mounted therein are automatically moved from the first connection rail to a stock rail and stored therein, as desired. In the beginning of the first operation of the fine spinning frame, full roving bobbins produced by the flyer frame are mounted in the magazines and successively fed from the stock rail to the fine spinning frame rail through the second connection rail. Thereby, the fine spinning frames successively start to operate. Rovings are paid out from full roving bobbins suspended in the magazines of the magazine row supported by the fine spinning frame rail and are wound around the bobbins on the spindles of the fine spinning frames through the draft sections, snail wires and travelers. Fine spinning frames to which rovings are no longer fed are automatically stopped, and this information is reported to the operator. Thereby, the operator effects the carrying-out of the magazine row having empty bobbins suspended therein by moving it from the fine spinning frame rail in question to the standby rail. The movement of the magazine row is automatically effected by the operator manipulating the magazine driving mechanism. And the magazine rows having fresh full roving bobbins suspended therein are carried from the stock rail to the fine spinning frame rail via the second connection rail, and the operation of the fine spinning frames in question is restarted. On the other hand, empty bobbins carried out to the standby rail are subjected to a residual yarn treatment and then removed from the magazines. The removal of empty bobbins from magazines is effected by making use of the bobbin mounting mechanism. The empty bobbins thus removed are fed to the fine spinning frames. Further, full roving bobbins are automatically mounted in the empty magazine rows thus removed by the bobbin mounting mechanism.

According to the invention as claimed in Claim 1, full roving bobbins produced by a flyer frame are automatically mounted in magazines on a first connection rail by a bobbin mounting mechanism, said magazines are automatically conveyed from the first connection rail to a stock rail by an automatic conveying tow vehicle and then automatically conveyed from said stock rail to a fine spinning frame rail by a magazine driving mechanism. Empty bobbins produced in the fine spinning frame are automatically conveyed from the fine spinning frame to a standby rail by the magazine driving mechanism. Thereby, the operator's labor can be saved.

According to the invention as claimed in Claim 2, the removal of residual yarns can be automatically effected, thereby making it possible to increase the operating efficiency and automate the operation of removing empty bobbins from the magazine.

According to the invention as claimed in Claim 3, full roving bobbins produced by a fine spinning frame are automatically conveyed to a position below a magazine positioning mechanism by a conveyor, each full roving bobbin being positioned by being separated from the following ones by a bobbin positioning mechanism, and they are successively mounted in magazines by a multi-axis robot; thus, conveyance of full roving bobbins from a flyer frame and the operation of mounting them in magazines can be automated, achieving labor saving.

According to the invention as claimed in Claim 4, full roving bobbins produced by a flyer frame are

placed on a conveyor automatically or manually by an operator and conveyed to the position of a lifter, where an operator manually places them on the lifter, whereupon the lifter lifts a plurality of full roving bobbins and mounts them in a single magazine at the same time. Thus, the operator's labor can be saved.

According to the invention as claimed in Claim 5, full roving bobbins produced by a flyer frame are manually placed by an operator on pallets placed on carriages traveling on the ground, whereupon an automatic conveying tow vehicle automatically convey them to the position of a lifter and automatically mounts them in magazines by successive amounts each corresponding to a single pallet.

According to the invention as claimed in Claim 6, the operation of removing empty bobbins from magazines can be automatically effected by a bobbin mounting mechanism; thus, automation and labor saving can be attained.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which;

Fig. 1 is a schematic perspective view showing the whole of a first embodiment of the present inventive apparatus;

Fig. 2 (a) is a plan view of a point switching mechanism and Fig. 2 (b) is a sectional view of a rail;

Fig. 3 (a) is a plan view of a magazine, Fig. 3 (b) is a side view and Fig. 3 (c) is a front view;

Fig. 4 (a) is a side view of a magazine driving mechanism, and Fig. 4 (b) is a plan view thereof;

Fig. 5 (a) is a front view of the magazine driving mechanism and Fig. 5. (b) is a front view, in longitudinal section, of the pressing plate portion of the magazine driving mechanism;

Fig. 6 (a) is a plan view showing an example of disposition of the magazine driving mechanism for fine spinning frame rails and Fig. 6. (b) is a side view thereof;

Fig. 7 is a schematic side view showing a first embodiment of a bobbin mounting mechanism;

Fig. 8 is a plan view of the magazine positioning mechanism in Fig. 7;

Fig. 9 is a sectional view taken along the line Y-Y in Fig. 8;

Fig. 10 (a) is a fragmentary side view in Fig. 8, Fig. 10 (b) is a sectional view taken along the line X_a-X_a in Fig. 8, Fig. 10 (c) is a sectional view taken along the line X_b-X_b in Fig. 8, Fig. 10 (d) is a sectional view taken along the line X_c-X_c in Fig. 8, and Fig. 10 (e) is a sectional view taken along the line X_d-X_d in Fig. 8;

Fig. 11 is a side view of the bobbin positioning mechanism and lifter in Fig. 7;

Fig. 12 is a front view in Fig. 11;

Fig. 13 is a schematic perspective view of a multi-axis robot in Fig. 7;

Fig. 14 is a schematic side view showing a second embodiment of a bobbin mounting mechanism;

Fig. 15 is a schematic side perspective view of a lifter in Fig. 14;

Fig. 16 is a schematic plan view showing a third embodiment of a bobbin mounting mechanism;

Fig. 17 is a perspective view showing the relation between an automatic conveying tow vehicle of the ground traveling type, carriages and pallets in Fig. 16;

Fig. 18 (a) is a plan view of the lifter in Fig. 16 and Fig. 18 (b) is a side view;

Fig. 19 (a) is a side view of of an automatic conveying tow vehicle of the rail traveling type, Fig. 19 (b) is a front view thereof and Fig. 19 (c) is a schematic plan view thereof;

Fig. 20 is a side view of a residual yarn removing device;

Fig. 21 is a front view of the residual yarn removing device; and

Fig. 22 is a principal side view, in longitudinal section, of the residual yarn removing device.

Fig. 1 is a perspective view showing the entire arrangement of the present inventive apparatus. In this figure, the character A denotes flyer frames; B denotes fine spinning frames; C denotes fine spinning frame rails; D denotes stock rails; E denotes standby rails; F denotes a first connection rail; G denotes a second connection rail; H denotes point switching mechanisms; I denotes magazines; Ka and Kb denote bobbin mounting mechanisms; M denotes an automatic conveying tow vehicle of the ground traveling type; and M denotes residual yarn removing means.

The constructions of the fine spinning frames A and flyer frames B are the same as known ones, and a detailed description thereof is omitted.

The fine spinning frame rails C are disposed above and along the respective fine spinning frames substantially throughout the length thereof from the gear end to the out end of each fine spinning frame B. Each fine spinning frame B has spinning spindles disposed in two rows, front and rear; thus, two fine spinning frame rails C are disposed for each fine spinning frame B.

The stock rails D are spaced from the fine spinning frame rails C.

The standby rails E are also spaced from the fine spinning frame rails C.

The first connection rail F is connected from the bobbin mounting mechanisms Ka and Kb to the stock rails D and standby rails E through the point switching mechanisms H in the same line.

The second connection rail G connects the stock rails D and standby rails E to the fine spin-

ning frame rails C through the point switching mechanisms H in the same line.

Each point switching mechanism H, as shown in Fig. 2 (a) and (b), comprises a straight travel rail 1 and a branch rail 3, the portion including a junction 3 therebetween being cut in arcuate form, a switching rail 4 fitted in said cut portion and adapted to be turned around the junction 3 by an air cylinder or other suitable switching actuator 5, so that it is selectively switched for connection to either one. At each connecting point, the point switching mechanism H of said construction is installed. The rails C, D, E, F and G are the same in cross-sectional shape as shown in Fig. 2 (b), each being formed of a channel member having a longitudinally extending groove b in the bottom surface.

The magazines I are supported for travel along the rails C, D, E, F and F. Each I includes a support plate 8 suspended through a plurality of carriages 7, as shown in Fig. 3 (a), (b), (c). Each carriage 7 includes, for example, load support wheels 9 moving on the bottom surface of the rail c, and rolling-preventive wheels 10 contacted with the lateral surfaces of the rail c and is connected to the support plate 8 through a support rod 11. Each support plate 8 has a plurality (for example, 6 - 12) bobbin holders 12 suspended therefrom. The bobbin holders 12 are of the so-called one-touch type, adapted to automatically hold full roving bobbins 13 or empty bobbins 13a when the latter are fitted thereon from below and to release them when they are pushed upward again. The magazines I are connected in a row by connecting members 14. They are connected by connecting pins 15 and slits 16 and bendable so that they can move along the corners of the rails C, D, E, F and G. The number of magazines to be connected is such that the full roving bobbins 13 for all spindles on the front or rear side of one fine spinning frame B can be exchanged at the same time.

The magazine driving mechanisms J are disposed at suitable places adjacent the gateways of the fine spinning frame rails C, the gateways of the stock rails D and the gateways of the standby rails E and movable into contact with and away from the magazines I. When they contact, they do so each sitting astride one or more magazine I so as to drive the magazine row forward or backward. In addition, the magazine driving mechanisms J may be installed at suitable places in the first and second connection rails F and G.

The magazine driving mechanism J is arranged as shown in Fig. 4 (a) and (b) and Fig. 5 (a) and (b), comprising rails 17 for the load support wheels 9 of the magazine I to move therealong, a drive belt 23 of required length (at least 1. 5 times of the length of the magazine I) endlessly entrained around a driving roller 18, a driven roller 19 and guide rollers 20 and 21 and adapted to be driven forward and backward along said rails 17 by a driving motor 22, and a pressing plate 25 for pressing the driving belt 23 from above against the load support wheels 9 of the magazine I by a cylinder 24 so as to drive the magazine I along the rails 17. The rails 17 are spaced to allow the passage of the rolling-preventive wheels 10 and support rods 11 of the magazine I.

The rails 17 have lateral plates 26 integrally attached thereto, said lateral plates 26 rotatably supporting the shaft 18a of a driving roller 18. The driving motor 22 is fixed on the lateral plates 26 and drives the driving roller 18 forward and backward through a speed reducer. The driven roller 19 is rotatably supported on a shaft 19a having sliders 28 fixed on the opposite sides thereof, said sliders 28 being reliably supported by the lateral plates 26, the positions of said sliders 28 being adjusted in slits 30 by tension adjusting bolts 29.

The pressing plate 25 is rotatably supported at its proximal end through a bracket 25a between the lateral plates 26 through a fulcrum shaft 31 and is supported by a return spring 32 connected to its distal end so as to cancel the pressing imposed by the driving belt 23. The return spring 32 is fixed at one end thereof to a top plate 26a and connected at the other end to the pressing plate 25.

The cylinder 24 is installed above the pressing plate 25. That is, the cylinder 24 is disposed between the lateral plates 26 and pivotally supported at its proximal end on a pin 33 and is connected at its distal end to a cushion rod 34. The cushion rod 34 comprises a proximal end rod 34a and a distal end rod 34b with a cushion spring 34c interposed therebetween, and the two rods 34a and 34b are adapted for longitudinal extension and contraction. The proximal end rod 34a is connected to the distal end of the piston rod 24a of the cylinder 24, while the distal end rod 34b is connected to one end of an arm 36 by a connecting pin 35. The arm 36 is disposed between the lateral plates 26 and pivotally supported at its intermediate portion by a pivot pin 37. The other end of said arm 36 is connected to a bracket 25b by a connecting pin 38, said bracket being fixed on the pressing plate 25.

Guide rollers 20 and 21 are rotatably supported on shafts 20a and 21a at the proximal and distal ends of the pressing plate 25.

The driving belt 23 is a V belt of trapezoid cross section (flat belt may also be used), and its outer side, that is, the wider bottom surface of the trapezoid is pressed against the load support wheels 9 of the magazine I. Two such driving belts 23 are employed, associated with the load support wheels 9 of the magazine I.

The magazine driving mechanisms J are installed at predetermined places on the rails C, D, E, F and G by cutting said rails.

The magazine driving mechanisms J are constructed in the manner described above and and their start is controlled at an operating section O. The operating section O indicates whether or not the magazines I are on the fine spinning frame rails C, stock rails D and standby rails E and also indicates individual system pictures. For example, in the case of carrying full roving bobbins 13 onto the first fine spinning frame rail C, the push button switch associated with the corresponding fine spinning frame C is pressed and the push button switch of any one of the stock rails D is pressed, thereby driving the magazine driving mechanism J in the carrying-in path of the magazine I via the second connection rail G for the fine spinning frame rail C from the corresponding stock rail D. At this time, the point switching mechanism J at the required position is switched. Pushbutton switches are installed in this manner for the rails C, D, E, F and G, and the operator selectively pushes them to effect the carrying in and out of the magazines I. Also installed in this operating section O are an emergency stop button and individual manual operating buttons.

In order to automatically stop the magazine driving mechanisms J, detectors P_1 and P_2 are installed at the initial and terminal ends of the stock rails D and the initial and terminal ends of the standby rails E, as shown in Fig. 6 (a) and (b), and correspondingly thereto, actuating members Q_1 and Q_2 are installed at the front and final ends of the train of magazines I, so that upon completion of the carrying in and out of the magazines I, the magazine driving mechanisms J are automatically stopped. Stated more concretely, Fig. 6 (a) and (b) shows a case of a fine spinning frame rail, wherein detectors P1 and P2, such as reflecting photoelectric sensors, are installed at the initial end or one end and terminal end or the other end of the rail C. And for carrying-in of the magazines I, the detector P1 at the initial end is made inoperable and the detector P2 at the terminal end alone is made operable, so that when the leading magazine I carried to the terminal end of the rail C, the magazine driving mechanism J is stopped. For carrying-out, the detector P_2 at the terminal end is made inoperable and the detector P_1 at the initial end alone is made operable, so that when the terminal end passes as the magazines I are carried out, the magazine driving mechanism J is stopped. These detectors P1 and P2 are arranged to decelerate the magazine driving mechanisms J and then stop them.

The arrangement of the bobbin mounting mechanisms Ka and Kb will now be described.

First, the bobbin mounting mechanism Ka, as shown in Fig. 7, comprises a magazine positioning mechanism R for positioning empty magazine trains on the first connection rail F and intermittently feeding them at a constant pitch (equal to the length of one magazine), a conveyor 39 for conveying full roving bobbins produced by a flyer frame A from the flyer frame A to a position below the magazine positioning mechanism R, a bobbin positioning mechanism S for separating the leading full roving bobbin from the following ones at the terminal end of the conveyor 39 for positioning purposes, and a multi-axis robot T for successively mounting full roving bobbins 13 positioned by the bobbin positioning mechanism S in the magazines positioned by the magazine positioning mechanism R.

The magazine positioning mechanism R, as shown in Figs. 8 through 10 (a) through (c), includes endless conveyor belts 40 adapted to be pressed against the support plate 8 for the leading magazine I, thereby successively feed out the magazines. Stated more concretely, support base plates 42 are fixed to a beam 41 having the first connection rail F fixed thereto, and two guide rods 43 are fixed to said support base plates 42 at right angles to the longitudinal direction of the first connection rail F. Movable plates 45 are slidably supported on said two guide rods 43 through support sleeves 44. A cylinder 46 is fixed to the movable plate 45 between the two support sleeves 44 and its piston rod 47 is connected to the support base plate 42; thus, said cylinder 46 moves the movable plate 45 toward and away from the support base plate 42. The movable plate 45 rotatably supports pulleys 50 through 54 through brackets 48 and 49 at opposite ends. The endless conveyor belt 40 is entrained around these pulleys 50 through 54. One pulley 52 is connected to a driving motor 55. The movable plate 45 is provided with a plurality of pressing rollers 56 for pressing the endless conveyor belt 40 against the lateral surface of the support plate 8. That is, pressing rollers 56 are rotatably supported by a support plate 57 having guide rods 58 at two longitudinally spaced places. The guide rods 58 are slidably supported in support sleeves 59 on the movable plate 45. A spring 60 is interposed in the compressed state between the support plate 57 and the support sleeve 59, thereby pressing the pressing roller 56 against the endless conveyor belt 40 with respect to the movable plate 45. In addition, in order to prevent the endless conveyor belt 40 from deviating axially of the pulleys 50 through 54, each of the pulleys 50 through 54 is formed with a plurality of ridges, while the back side of the endless conveyor belt 40 is also formed with similar ridges. The pressing rollers 56 are also formed with similar ridges.

The conveyor 39 for conveying full roving bobbins 13 produced by a flyer frame A from the latter to a place below the magazine positioning mechanism R comprises an endless belt 40 disposed along the flyer frame A, as shown in Fig. 7, to receive full roving bobbins 13 delivered from the flyer frame A to deliver them axially of the bobbins.

The bobbin positioning mechanism S for separating each full roving bobbin from the following ones at the terminal end of the conveyor 39 and positioning it comprises, as shown in Figs. 11 and 12, a conveyor belt 61 large enough to receive a single full roving bobbin 13, a lifting block 65 for lifting and lowering the support frame 62 of the belt conveyor 61 with respect to base blocks 63 by guide pillars 64, a lifting motor 66 for lifting and lowering said lifting block 65 by a ball screw and ball nut combination (not shown), a stopper 67 for positioning the front end of a bobbin, side guides 68 for positioning the opposite sides of a bobbin, cylinders 69 or actuating said side guides 68, a sensor 70 for stopping the conveyors 39 and 61 by detecting the front end of a full roving bobbin 13 abutting against the positioning stopper 67 as said full roving bobbin rides on the belt conveyor 61, and a sensor 71 for stopping the lifting motor by detecting a full roving bobbin 13 on the belt conveyor 61 reaching a predetermined lifted position.

The multi-axis robot T, as shown in Fig. 13, comprises a fixed support sleeve 72, a rotatable pillar 73 rotatably erected on said fixed support sleeve 72, a first arm 74 pivotally connected at its proximal end to the upper end of the rotatably pillar 73, a second arm 75 pivotally connected at its proximal end to the distal end of the second arm 75, a third arm 76 connected to the distal end of the second arm 75 for rotation around the longitudinal axis of the second arm 75, a fourth arm 77 pivotally connected at its proximal end to the distal end of the third arm 76, and a bobbin support bar 78 fixed to the distal end of said fourth arm 77.

The multi-axis robot T is arranged so that when full roving bobbins conveyed from a flyer frame A are positioned at a predetermined lifted position by the bobbin positioning mechanism S, said robot mounts said full roving bobbins one by one on the bobbin holders 12 of a magazine I positioned by the magazine positioning mechanism R, the movements of the movable portions of the robot being automatically effected by a program or the like prepared by teaching. Stated more concretely, the full roving bobbin is gripped by inserting the bobbin support bar 78 into its central hole. In addition, the multi-axis robot T is also applied when empty bobbins are to be removed from the magazines I.

The arrangement of the bobbin mounting mechanism Kb will now be described. The bobbin mounting mechanism Kb, as shown in Fig. 14, comprises a magazine positioning mechanism R, a lifter U installed immediately below the positioning mechanism R so that it can be lifted and lowered, adapted to position thereon the same number of full roving bobbins 13 at the same pitch as the bobbins mounted in a single magazine I and mount the positioned full roving bobbins 13 in a single magazine I at the same time, and a conveyor 79 for conveying full roving bobbins produced by a flyer frame A from the latter to the lifter U.

The magazine positioning mechanism R described above is the same as that previously described.

The lifter U, as shown in Fig. 15, comprises a lifting block 82 adapted to be lifted and lowered by a guide pillar 81 with respect to a base block 80, and a lifting motor 84 for lifting and lowering said lifting block 82 through a chain 83. A plurality of pegs 85 are installed on the lifting block 82 for positioning thereon the same number of full roving bobbins 13 at the same pitch as the bobbins mounted in a single magazine I. The operator manually mounts full roving bobbins conveyed by a conveyor 79 on the pegs 85. After the same number of full roving bobbins as that of bobbins mounted in a single magazine I have been mounted on the pegs 85, the lifting block 82 is lifted to mount the full roving bobbins 13 placed on the lifting block 82 on the bobbin holders 12 of the magazine I at the same time. This lifter U is also applied when empty bobbins are to be removed from the magazine I.

Another bobbin mounting mechanism Kc, as shown in Fig. 16, comprises a magazine positioning mechanism R, pallets 86 for removably positioning thereon full roving bobbins 13 through the same number of pegs 86a as the bobbins mounted in a single magazine I disposed at the same pitch as said bobbins, a carriage 87 for removably positioning thereon said pallets 86. an automatic conveying tow vehicle 88 of the ground traveling type including a plurality of said carriages 87 connected together and adapted to be moved between a position below the magazine positioning mechanism R and a plurality of flyer frames A, and a lifter V disposed immediately below said magazine positioning mechanism R and adapted to position the pallets 86 placed on the carriage 87 conveyed to a position immediately below said magazine positioning mechanism R on said automatic conveying tow vehicle 88, starting with the leading pallet 87, and mount the full roving bobbins 13 placed on the pallets in a single magazine I at the same time.

The magazine positioning mechanism R is the same as described above.

The pallet 86, as shown in Fig. 17, has pegs 86a disposed on its surface in a predetermined pattern, and positioning holes 86b at positions cor-

responding to the positioning pins 87a on the carriage 87. The carriage 87 has its front wheels fixed and its rear wheels rotatably attached thereto, supports a pallet at the front and rear ends of the latter by its front and rear pillars 87b and 87c, and has a fork insertion space 87d for the lifter V defined in the central region thereof.

The automatic conveying tow vehicle 88 has a battery mounted thereon to serve as a power source and automatically travels along a magnetic guidance line 89 laid on the floor surface. The magnetic guidance line 89 extends from among the flyer frames A to the position of the lifter V. In addition, the automatic conveying tow vehicle 88 may be of the radio or light guidance type besides the magnetic guidance type. This automatic conveying tow vehicle 88 connects pallets 86 through carriages 87 so as to mount a number of full roving bobbins 13 corresponding to the number of spindles of a single flyer frame A. The carriages 87 conveys empty pallets 86 to the position of a flyer frame A by the automatic conveying tow vehicle 88 and at said position the operator manually takes the full roving bobbins out of the flyer frame A and manually mount them on the pegs 86a on the pallets 86.

The lifter V, as shown in Fig. 18 (a) and (b), fixed guides 90 for positioning carriages 87 connected together and conveyed by the automatic conveying tow vehicle starting with the leading carriage, positioning levers 91, positioning rollers 92, a lifting block 96 adapted to be lifted and lowered by a chain 94 and a lifting motor 95, and a fork 100 supported on said lifting block 96 and adapted to be advanced and retracted by a motor 97 and a rack 98 and pinion 99. The fork 100 is in the retracted position when the carriage 87 comes in but when the carriage 87 is positioned at a predetermined position, it is advanced to enter the form insertion space 87d, and the pallet 86 alone is lifted by the chain 94 and lifting motor 95 so that the full roving bobbins on the pallet 86 are simultaneously mounted on the bobbin holders 12 of the magazine I. Upon completion of the mounting operation, the pallet 86 alone is lowered empty onto the carriage 87. The positioning of the carriage 87 in the longitudinal direction is effected by somewhat retracting the automatic conveying tow vehicle 88 subsequently to the closing of the rear positioning lever 91 as viewed in the direction of advancement to bring the rear surface of the carriage 87 into abutment against the positioning lever 91. The positioning of the opposite lateral surfaces of the carriage 87 is effected by the positioning rollers 92. The positioning rollers 92 are adapted to be driven by the motor 92a. Positioned immediately above the thus positioned carriage 87 is the magazine I, and the full roving bobbins 13 are simultaneously mounted in the magazine I by supporting and lifting the pallet 86. In addition, the fork 100 is provided with positioning pins (not shown) for engagement with the positioning holes 86c of the pallet 86. Upon completion of the mounting operation, the magazine positioning mechanism R moves the magazine row by an amount corresponding to one pitch to position the subsequent empty magazines I, while the next carriage 87 is positioned by the automatic conveying tow vehicle 88 to enable the lifter V to effect simultaneous mounting. Thereafter, the above operation is repeated until the full roving bobbins 13 placed on all carriages 87 are mounted, whereupon the automatic conveying tow vehicle 88 having empty bobbins mounted thereon is moved to the next flyer frame A. In addition, this lifter V can be used to receive empty bobbins onto the pallet 86 from the magazine I. In this manner, the carriage 87 with empty bobbins removed from the magazine I onto the pallet 86 by the lifter V is conveyed to the flyer frame A to exchange the empty bobbins for full roving bobbins and then conveyed to a position immediately below the magazine positioning mechanism R.

Further, the above description refers to the case where a plurality of carriages are connected to one automatic conveying tow vehicle 88 to convey pallets 86. In this case, however, if full roving bobbins or empty bobbins are not mounted on the pallets 86 on all carriages 87 connected to the automatic conveying tow vehicle 88, they cannot be conveyed. This can be made possible by imparting the same automatic traveling function as that of the automatic conveying tow vehicle to all carriages 87, separating them from each other and allowing them to successively automatically travel to a position immediately below the magazine positioning mechanism R starting with the one which has completed the mounting of full roving bobbins at the flyer frame, whereby the operating time can be shortened.

The magazine row having full roving bobbins 13 mounted therein by any of said bobbin mounting mechanisms Ka, Kb and Kc is pulled or pushed from the first connection rail F to the stock rail D by the automatic conveying tow vehicle M traveling on these rails F and D. The automatic conveying tow vehicle M, as shown in Fig. 19 (a), (b) and (c), is from the rails F and D through a plurality of carriers 101. The carrier 101 has load support wheels 102 and rolling preventing wheels 103 and is connected to the main body 105 through a support rod 104. The main body 105 has mounted thereon traveling wheels 106 adapted to contact the lower surfaces of the rails F and D, reversible motors 107 for driving said traveling wheels 106, batteries 108 serving as power sources, a radio receiver 109, and a control device for controlling

the reverse motors 107 by the radio receiver 109. In addition, the power source for the automatic conveying tow vehicle M may be in the form of a system comprising a trolley line and a current collecting member. In that case, the trolley line is laid along the rails. The front portion of the main body 105 is provided with a hook 111 adapted to be releasably engaged with the support rod 11 which is part of a magazine. This automatic conveying tow vehicle can also be installed on the second connection rail F.

The arrangement of the residual yarn removing means N will now be described. The residual yarn removing means N is used to remove residual yarns from the empty bobbins in the magazine I row conveyed from a fine spinning frame rail C, said residual yarn removing means being installed somewhere in the standby rail E, as shown. As for the concrete arrangement, as shown in Figs. 20 through 22, it comprises a plurality of fixed suction sleeves 113 installed immediately below the standby rail E corresponding to a plurality of residual yarn bobbins 13b conveyed in the suspended state through the magazine I and communicating at their lower ends with a suction chamber 112, and lifting suction nozzles 115 in cylindrical form having an inner diameter greater than the outer diameter of bobbins and disposed in the respective fixed suction sleeves 113 so that they can be lifted and lowered.

The lifting suction nozzles 115 are longer in length than residual yarn bobbins 13b and connected at their upper ends to a lifting body 116 adapted to be lifted and lowered along a lifting guide 117 with respect to a suction chamber 112 and fixed suction sleeves 113.

The fixed suction sleeve 113 has a seal packing 118 installed around the periphery the of the upper end thereof to prevent suction air from leaking from between it and the lifting suction nozzle 115. Further, a thin annular blade orifice 119 is installed in the lower region of the inner surface of the fixed suction sleeve 113 to produce a turbulent action by its choking effect, thereby increasing the sucking action on the residual yarn. For a similar purpose, the communicating portion 120 between the lower end of the fixed suction sleeve 113 and the suction chamber 112 forms a communicating hole smaller than the inner diameter of the fixed suction sleeve 113.

The suction chamber 112 is connected at its lower end to a suitable dust collector (not shown) and fixedly supported at its four corners by pillars.

Installed above said residual yarn removing device N including said fixed suction sleeves 113 and lifting suction nozzles 115 is a magazine positioning mechanism R for moving magazines by one pitch each time. This magazine positioning mechanism R is the same as the one previously described. The removal of residual yarns is effected by lifting the lifting suction nozzles 115 by the lifting means 14 and inserting them into residual yarn bobbins suspended from the magazine I, whereby the residual yarns are extracted in a few seconds by being sucked downward.

Claims

1. An automatic roving conveying apparatus for textile machines comprising a plurality of fine spinning frame rails disposed along a fine spinning frame, a plurality of stock rails for full roving bobbins and standby rails for empty bobbins spaced from the fine spinning frame rails, a plurality of magazine rows individually removably supporting the same number of bobbins as the spindles of a single fine spinning frame and connected in a line and supported for traveling on said rails, bobbin mounting mechanisms for automatically mounting in a magazine full roving bobbins produced by a flyer frame, a first connection rail extending from the bobbin mounting mechanism to the stock rail and standby rail through point switching mechanisms, a second connection rail for connecting the stock rail and standby rail to the respective fine spinning frame rails through the point switching mechanisms, an automatic conveying tow vehicle capable of forward and reverse drive supported for traveling on the first connection rail alone or on the first and second connection rails and adapted to pull or extrude magazine rows one by one, and magazine driving mechanisms respectively disposed at the gateway of each fine spinning frame, the gateway of each stock rail and the gateway of each standby rail and movable into contact with and away from the magazines and arranged such that during contact, each magazine driving mechanism contacts one or more magazines astride the latter to drive the magazine row.

2. An automatic roving conveying apparatus as set forth in Claim 1, characterized in that it includes means for removing the residual yarns from the empty bobbins of the magazine row carried out of the fine spinning frame, and means for removing empty bobbins from the magazines.

3. An automatic roving conveying apparatus for textile machines characterized in that the bobbin mounting mechanism mentioned in Claim 1 comprises a magazine positioning mechanism for successively positioning empty magazine

rows, starting with the foremost one, on the first connection rail and intermittently feeding them at a fixed pitch, a conveyor for conveying full roving bobbins produced by a flyer frame from the flyer frame to a position below the magazine positioning mechanism, a bobbin positioning mechanism for separating each full roving bobbin from the following ones at the terminal end of said conveyor and positioning them, and a multi-axis robot for successively mounting full roving bobbins positioned by the bobbin positioning mechanism in the magazines positioned by the magazine positioning mechanism.

4. An automatic roving conveying apparatus for textile machines characterized in that the bobbin mounting mechanism mentioned in Claim 1 comprises a magazine positioning mechanism for successively positioning empty magazine rows, starting with the foremost one, on the first connection rail and intermittently feeding them at a fixed pitch, a lifter liftably positioned immediately below said positioning mechanism and adapted to position thereon the same number of full roving bobbins at the same pitch as the bobbins mounted in a single magazine and simultaneously mount a plurality of said positioned full roving bobbins in a single magazine during lifting movement, and a conveyor for conveying full roving bobbins produced by a flyer frame from the flyer frame to the position of the lifter.

5. An automatic roving conveying apparatus for textile machines characterized in that the bobbin mounting mechanism mentioned in Claim 1 comprises a magazine positioning mechanism for successively positioning empty magazine rows, starting with the foremost one, on the first connection rail and intermittently feeding them at a fixed pitch, a pallet for removably positioning thereon the same number of full roving bobbins at the same pitch as the bobbins mounted in a single magazine, a carriage for removably positioning said pallet thereon, an automatic conveying tow vehicle of the ground traveling type adapted to move a plurality of said carriages connected together between a position below said magazine positioning mechanism and a plurality of roving frames, a lifter positioned immediately below said magazine positioning mechanism and adapted to successively position the pallets, starting with the foremost one, carried on said automatic conveying tow vehicle to the position immediately blow said magazine positioning mechanism and lift the pallets alone from the carriage to simultaneously mount a plurality of full roving bobbins on the pallet in a single magazine.

6. An automatic roving conveying apparatus for textile machines characterized in that any one of the bobbin mounting mechanism mentioned in Claims 3 through 5 is used as the means for removing empty bobbins from the magazines.

FIG 1

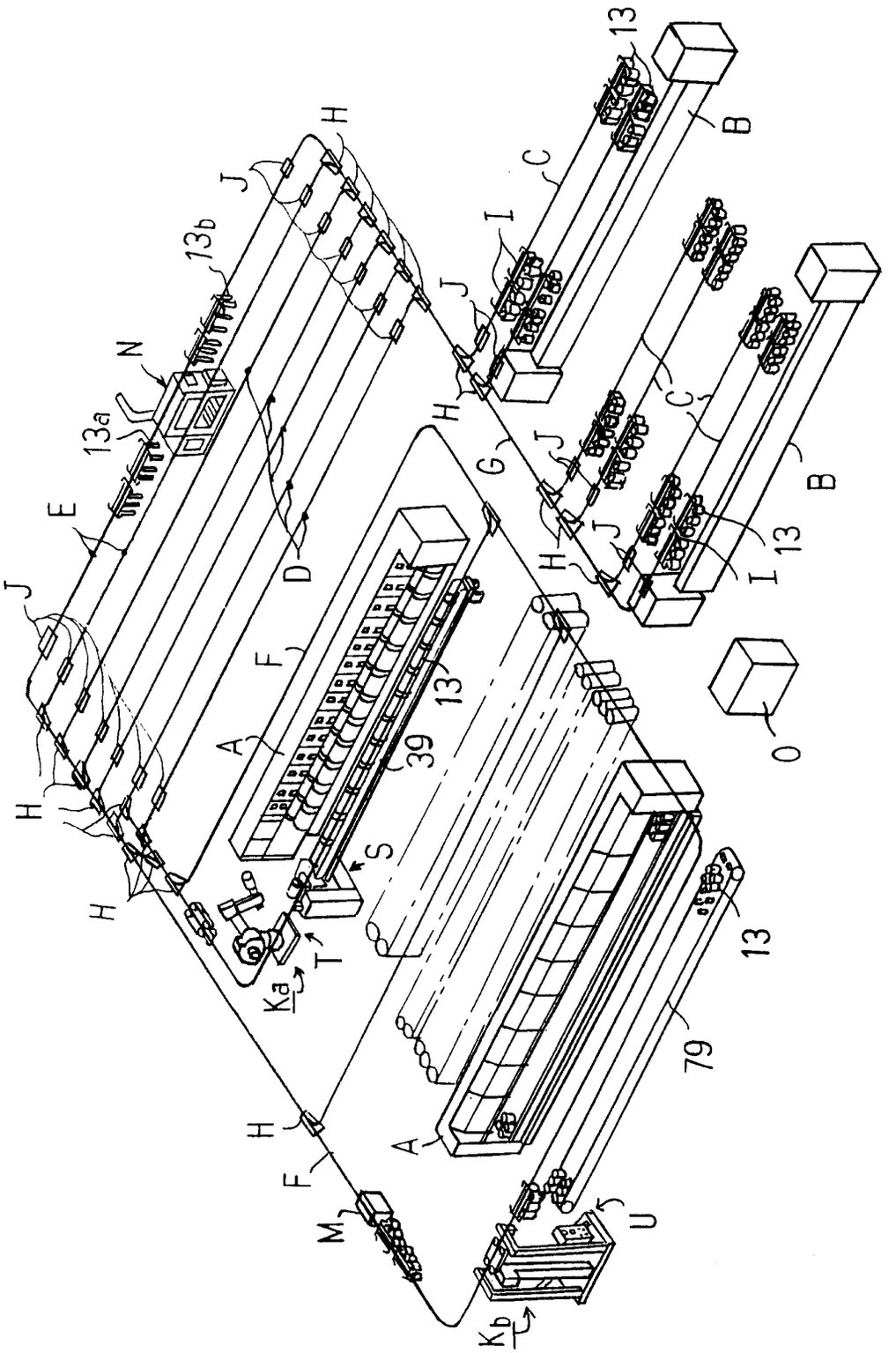


FIG 2

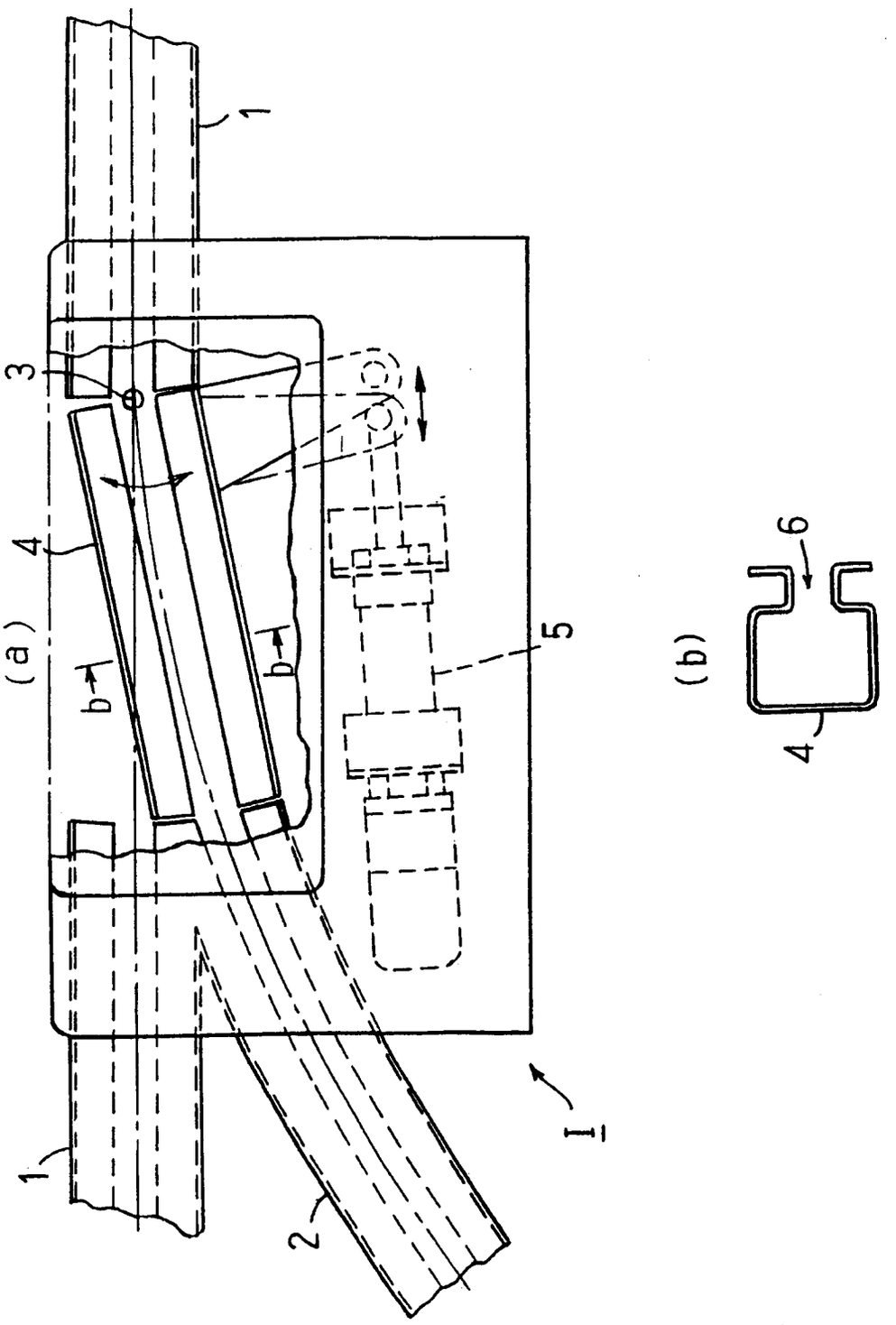


FIG 3

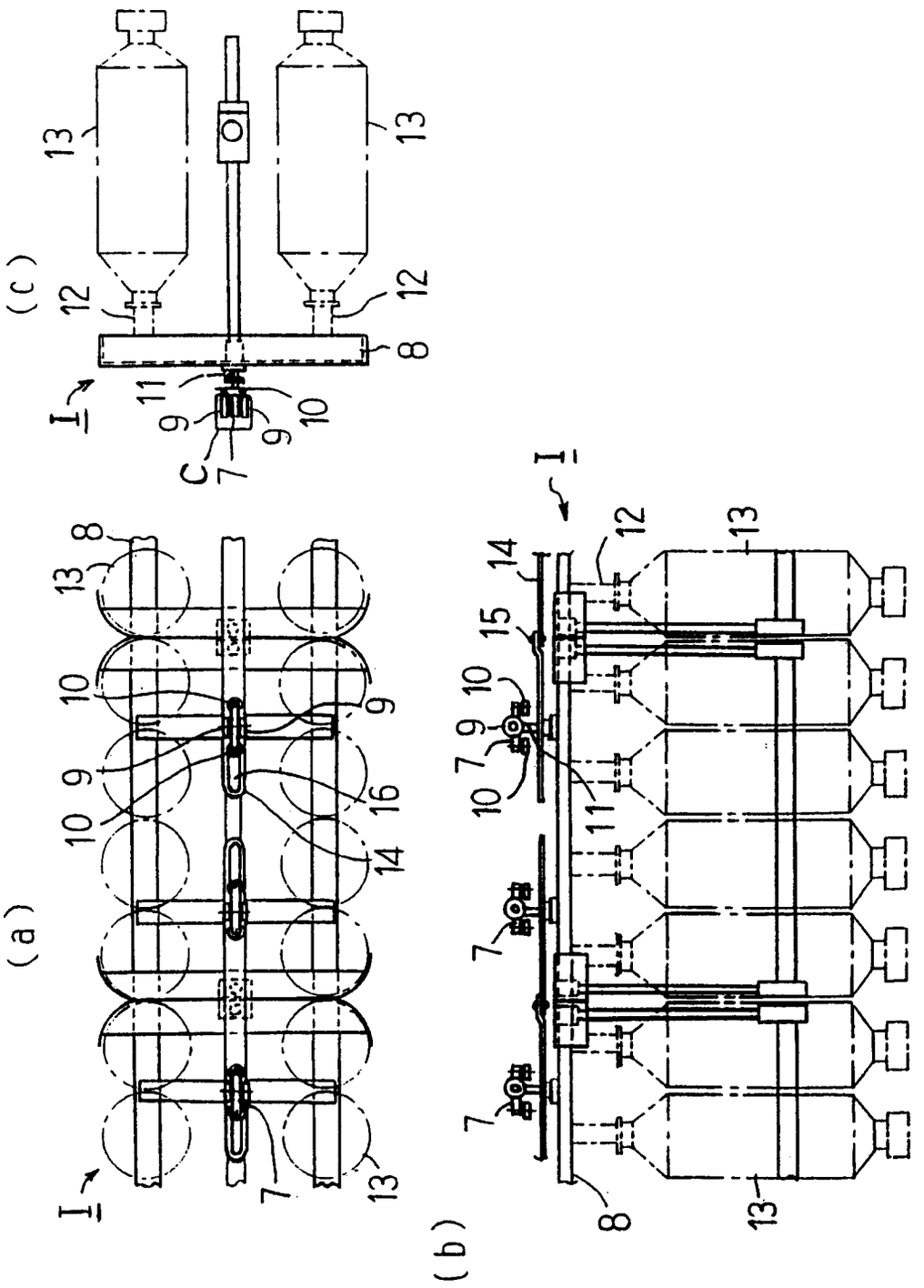
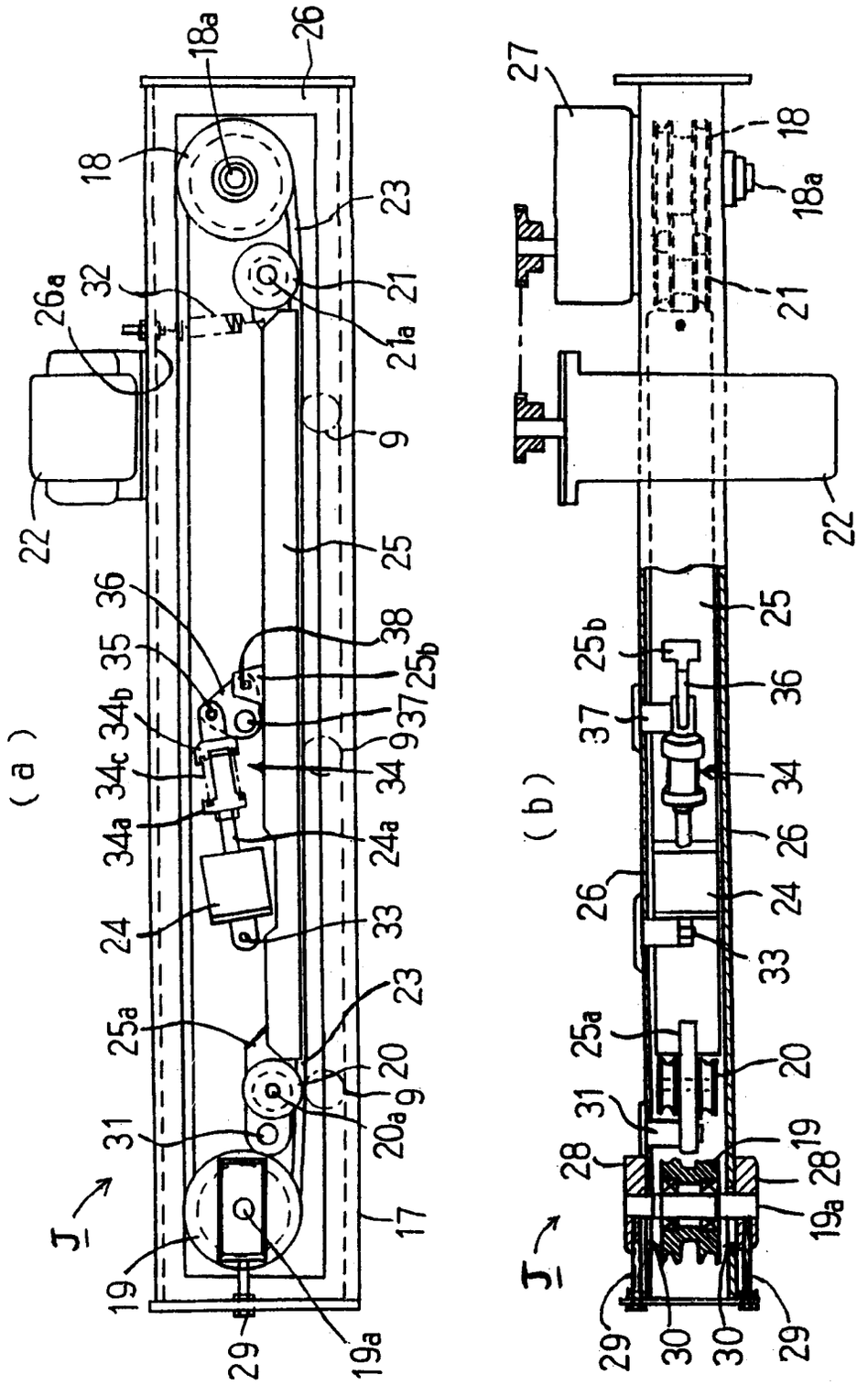


FIG 4


(a)
(b)
18a
26
18
23
21
21a
26a
32
9
22
25
36
38
35
25b
34b
37
34c
34
34a
24a
24
33
23
25a
20
20a
31
17
19
29
19a
27
18
18a
21
22
25
25b
37
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26
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25a
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31
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28
28
19a
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30
29

FIG 5

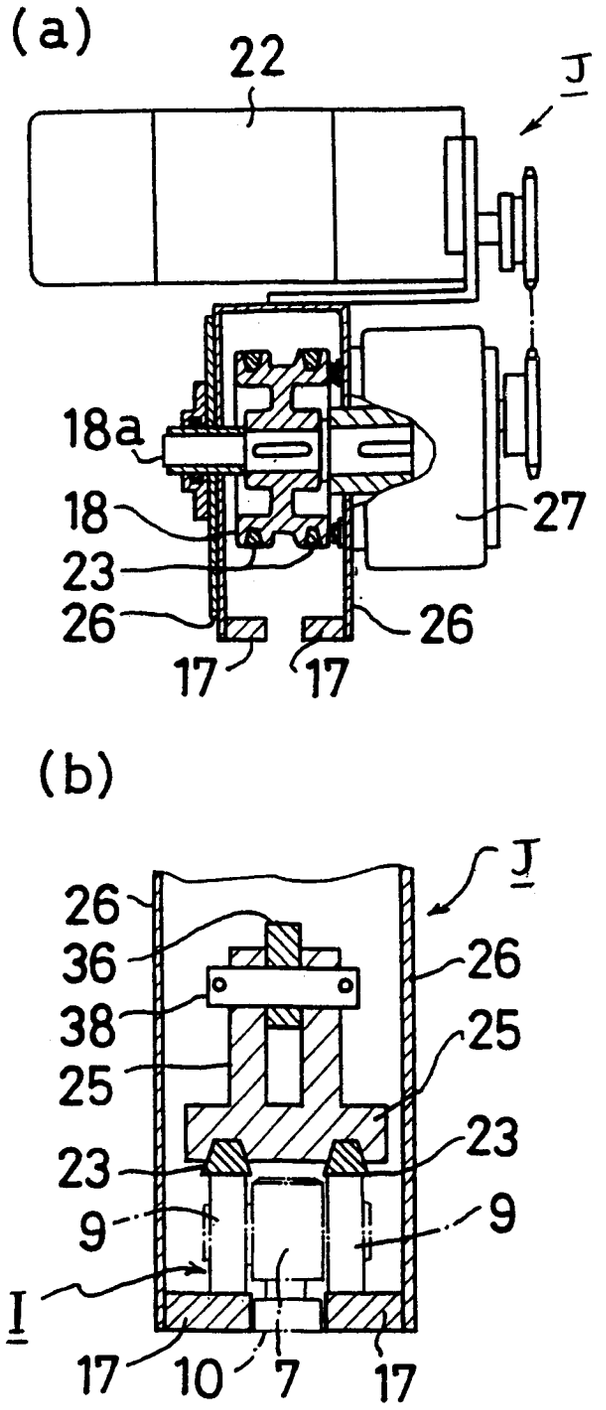


FIG 6

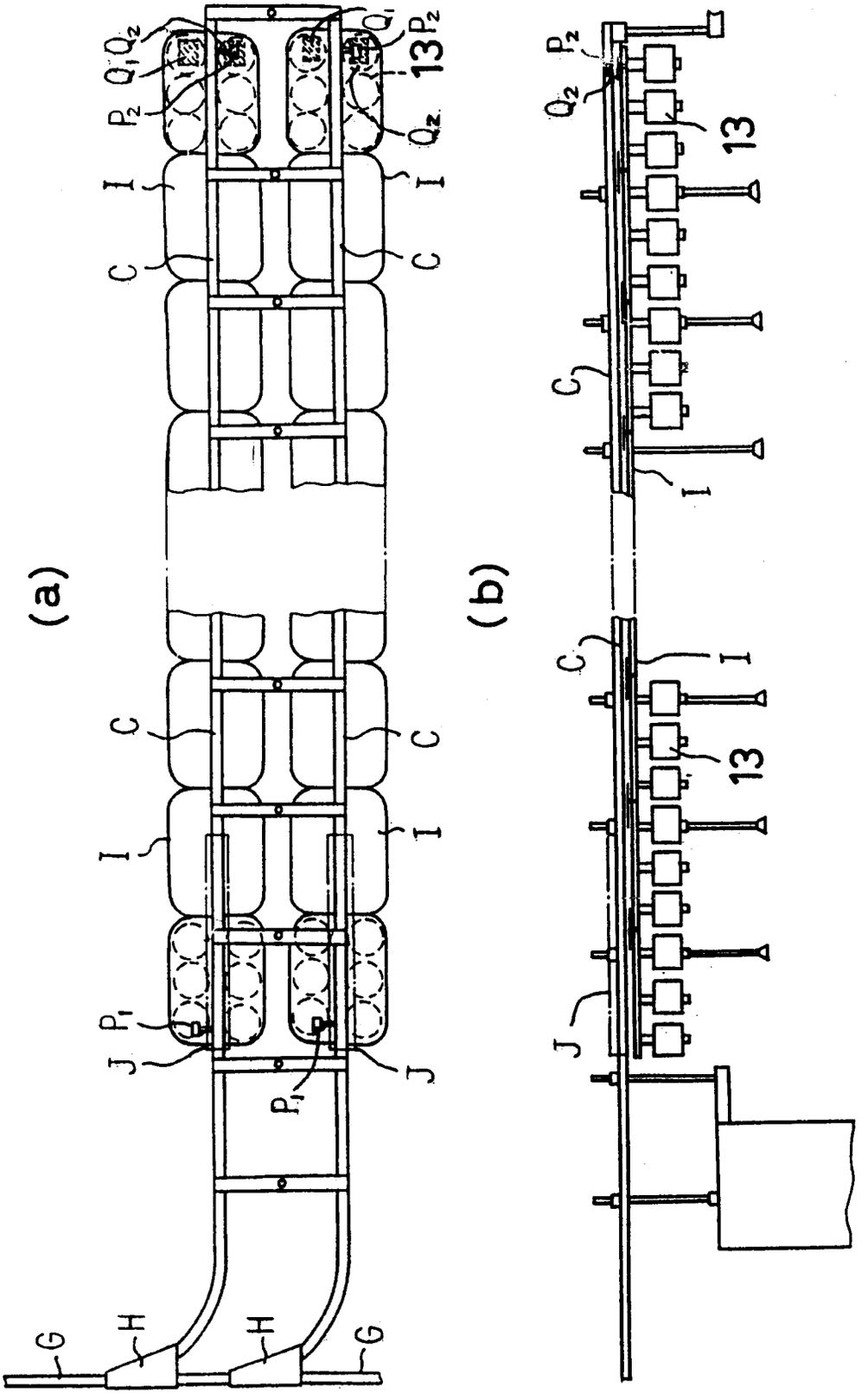


FIG 7

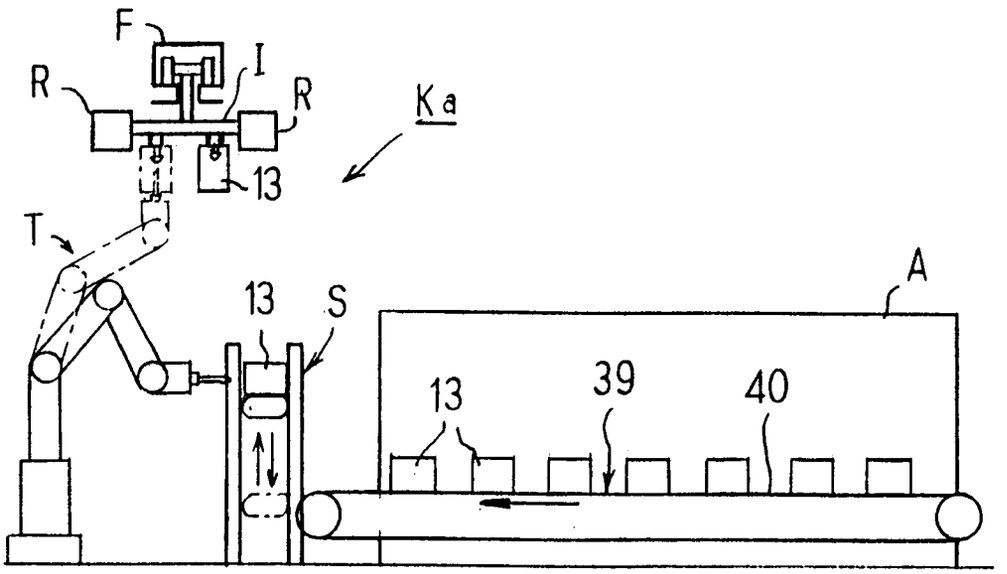


FIG 8

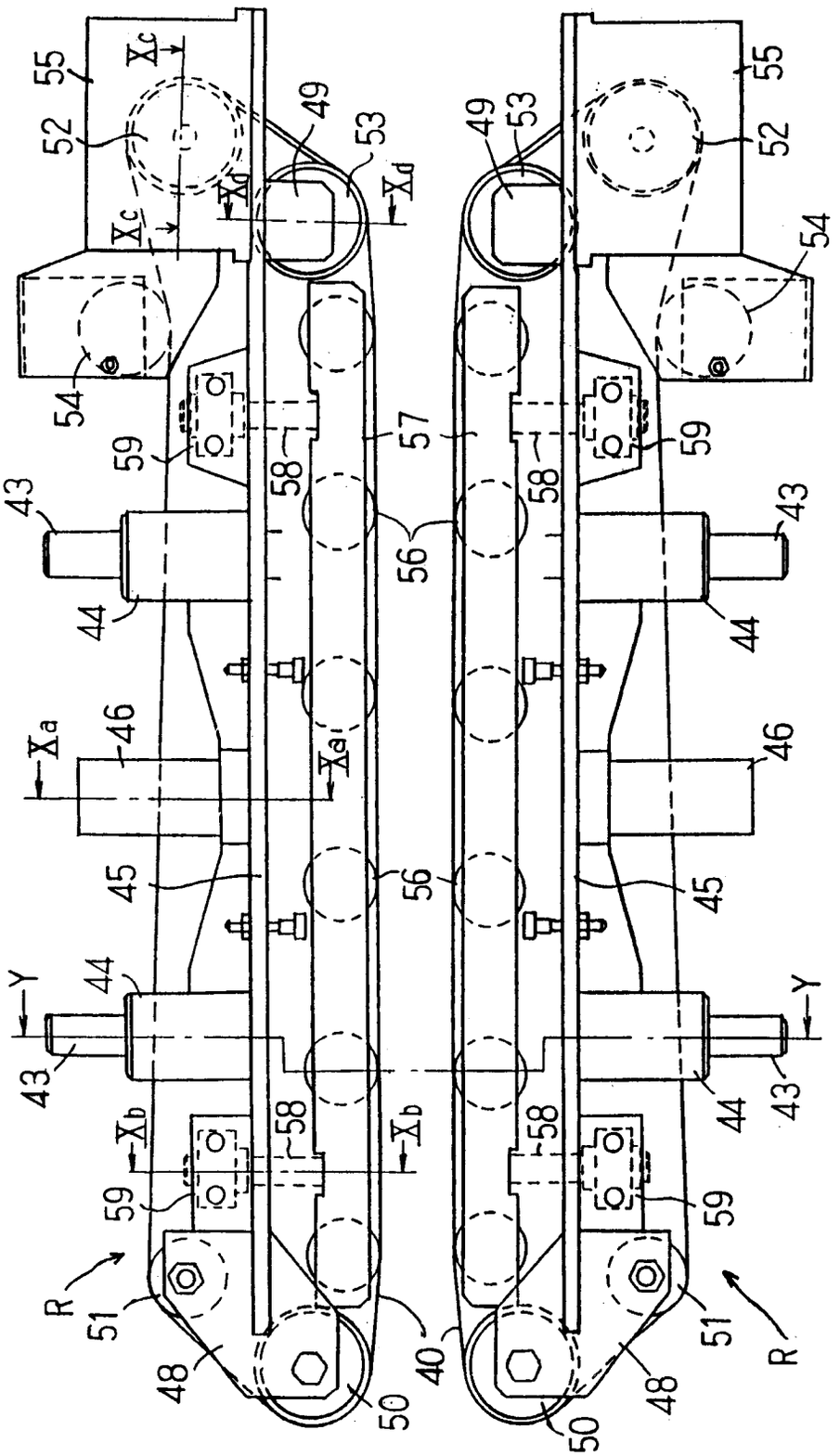


FIG 9

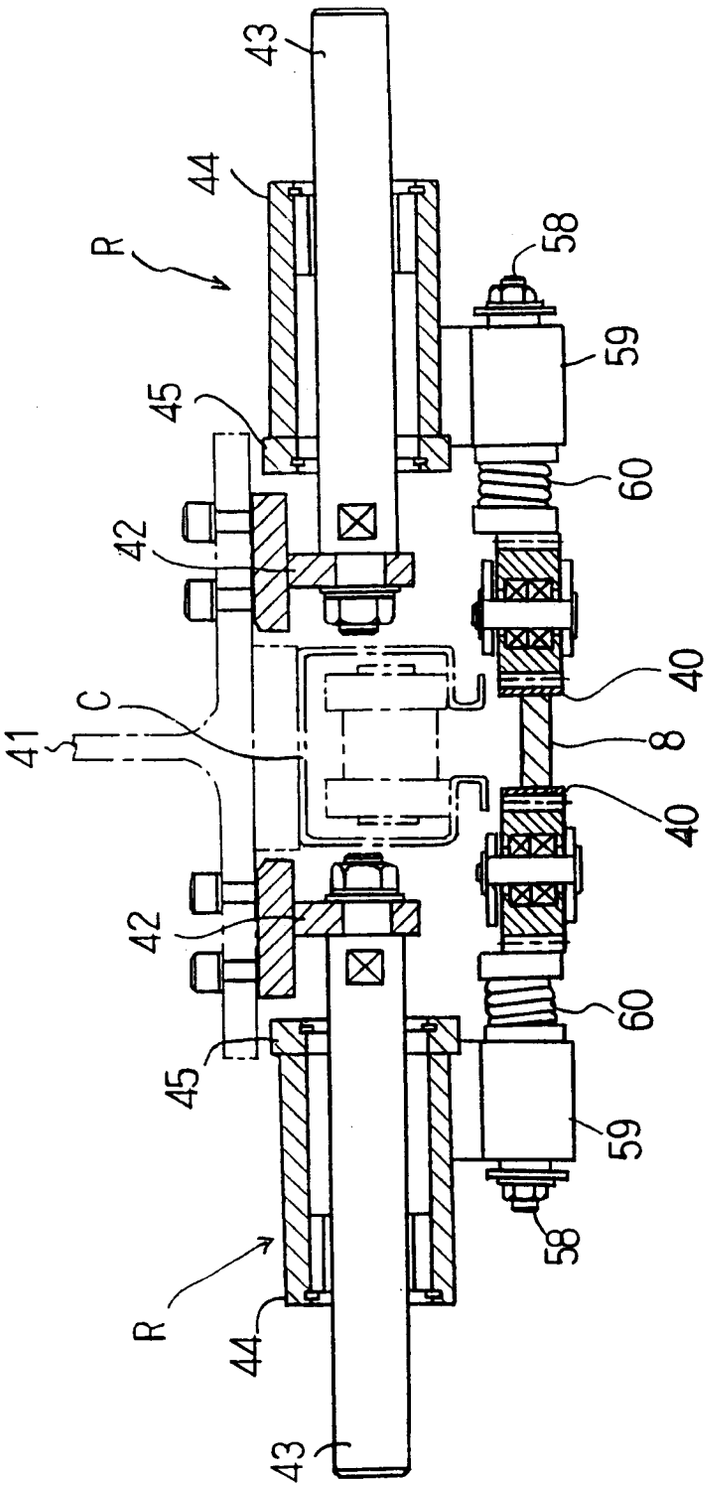


FIG 10

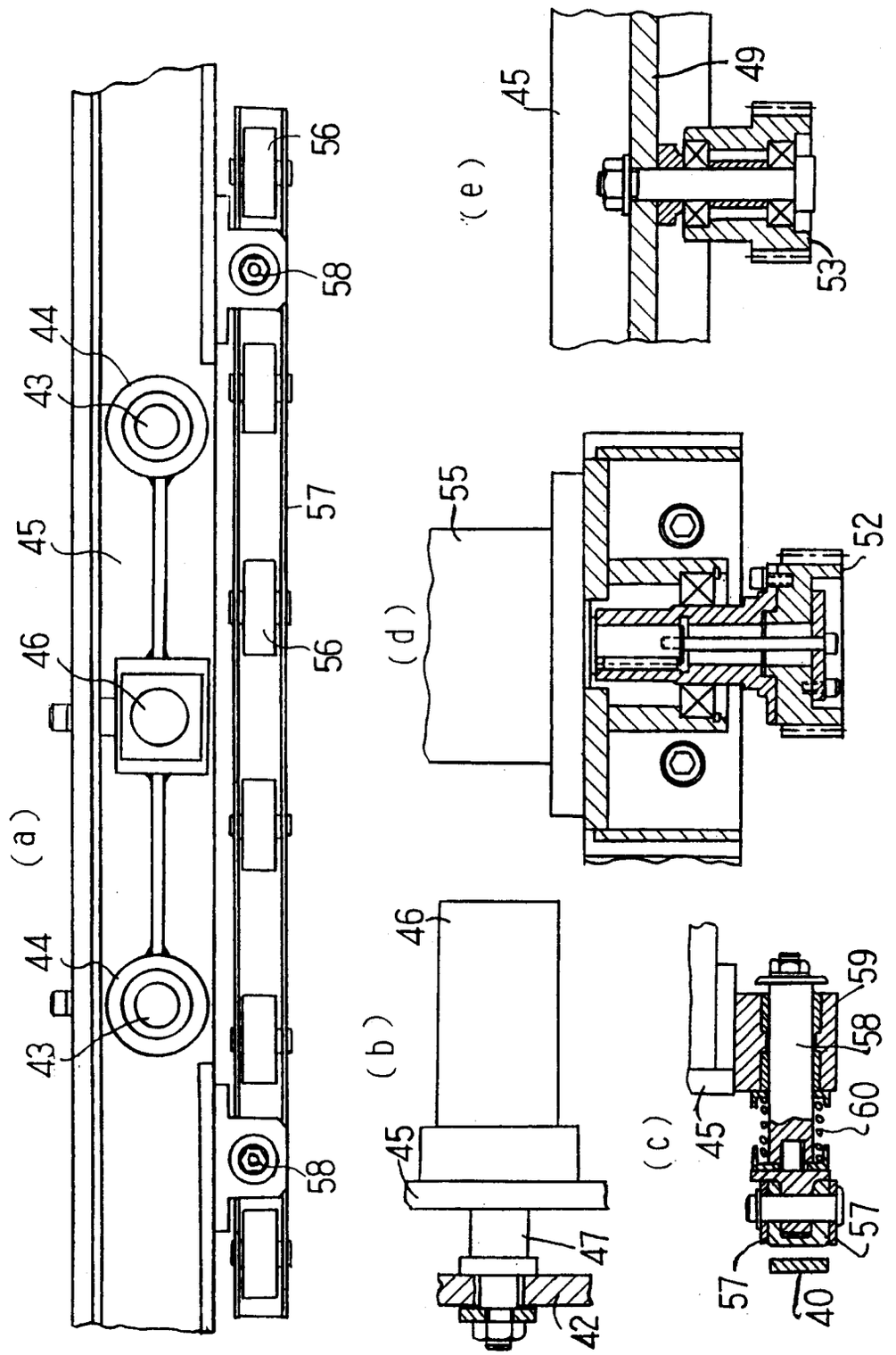


FIG 11

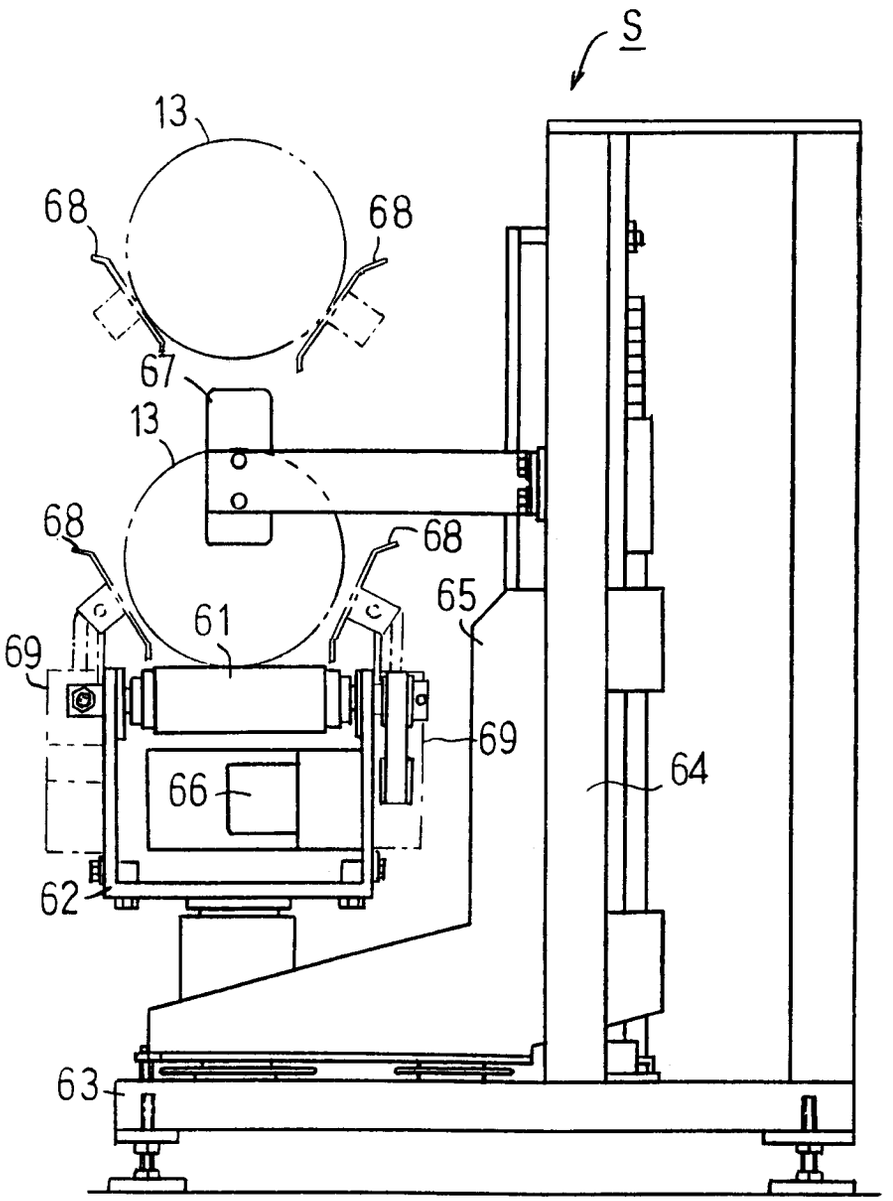


FIG 12

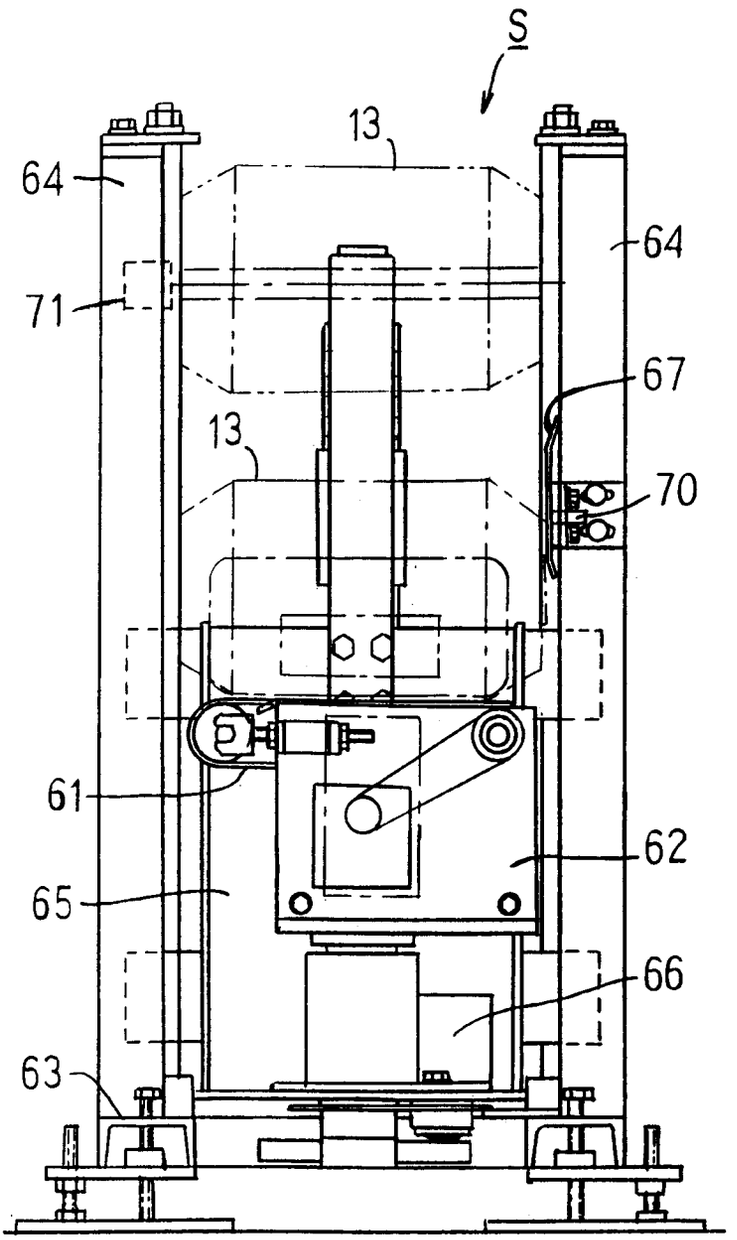


FIG 13

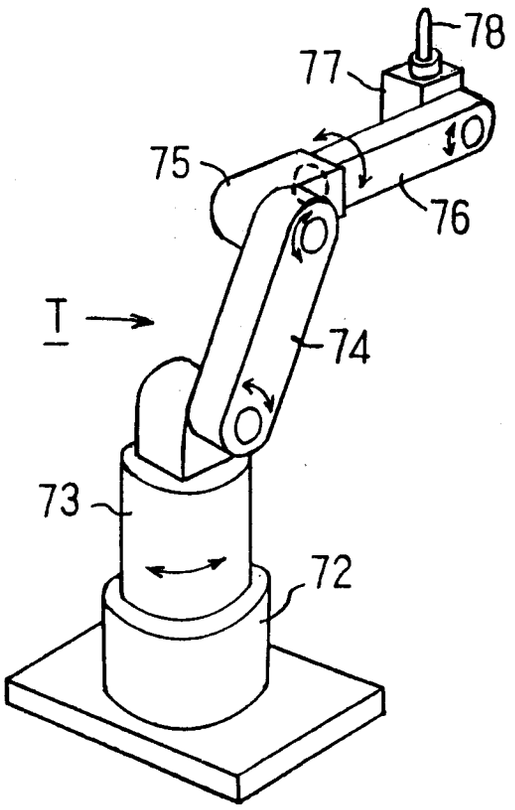


FIG 14

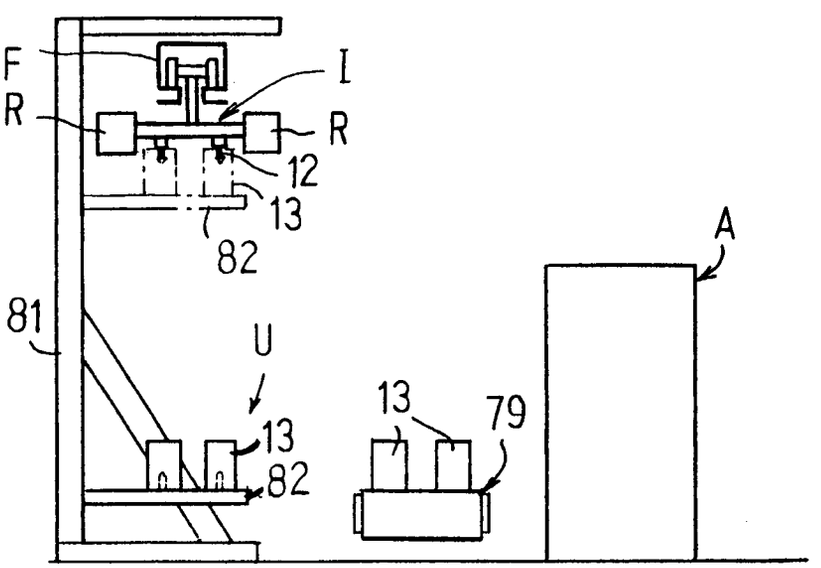


FIG 15

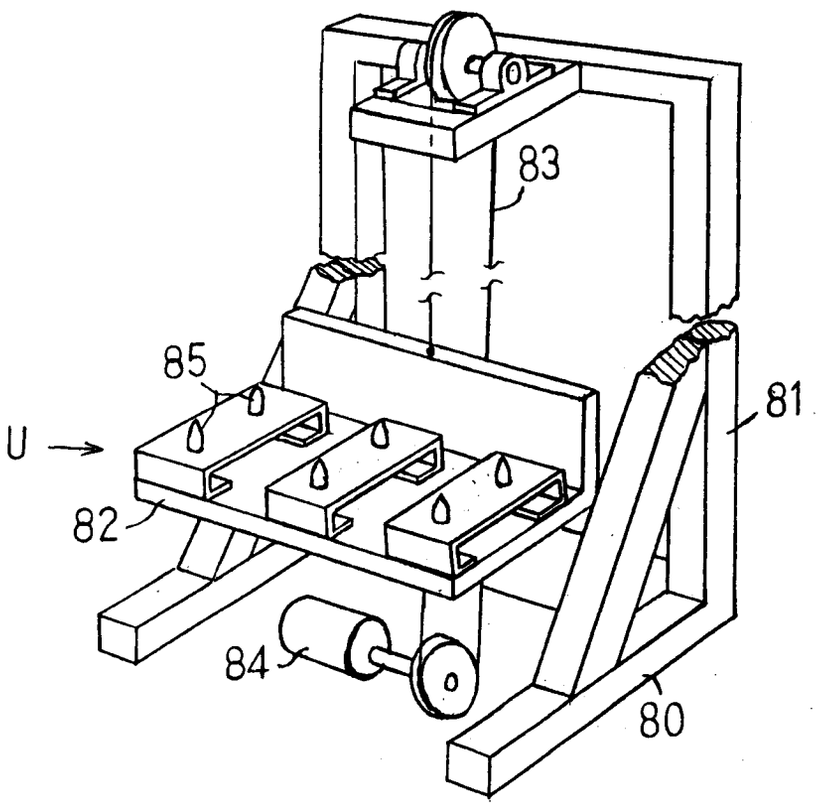


FIG 16

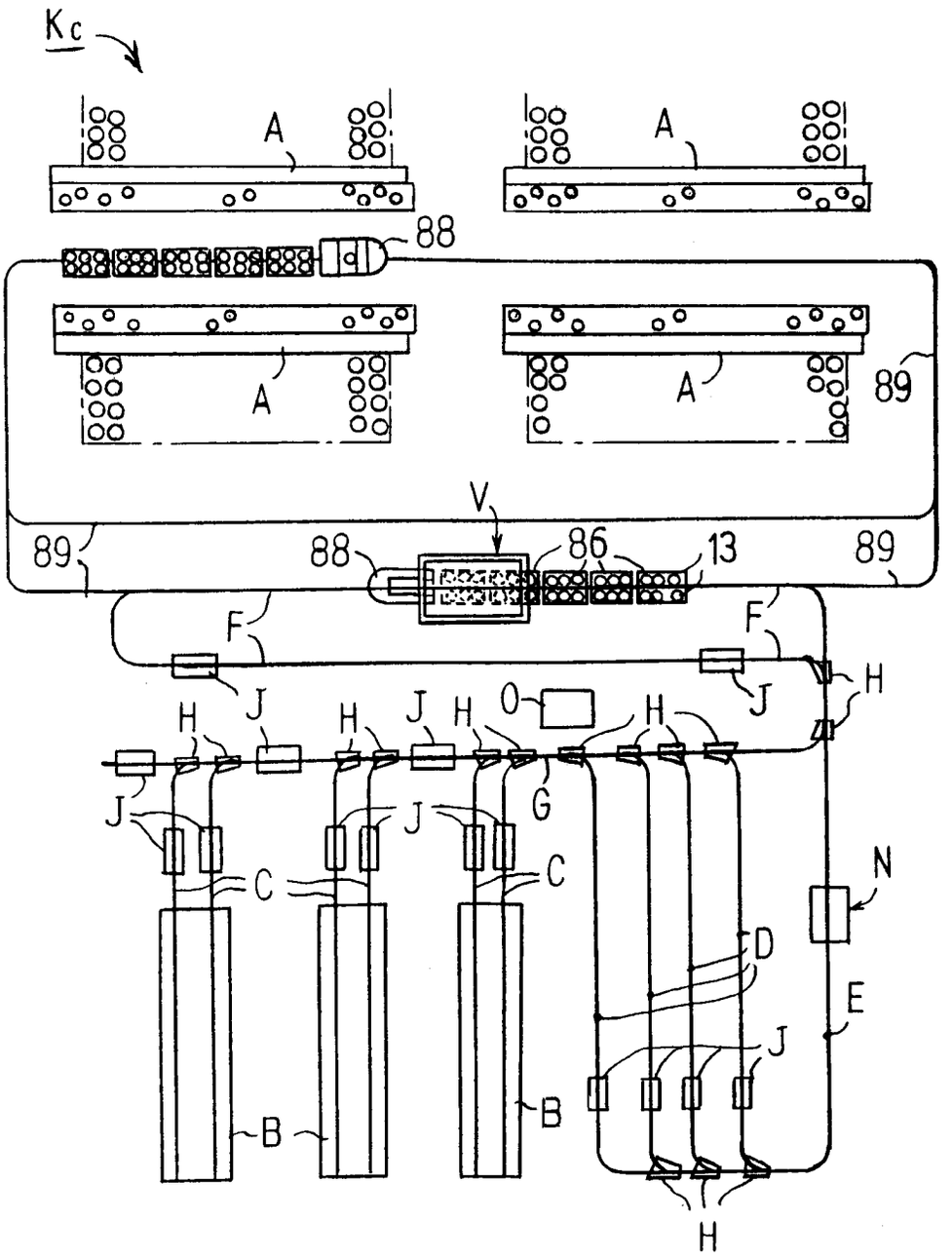


FIG17

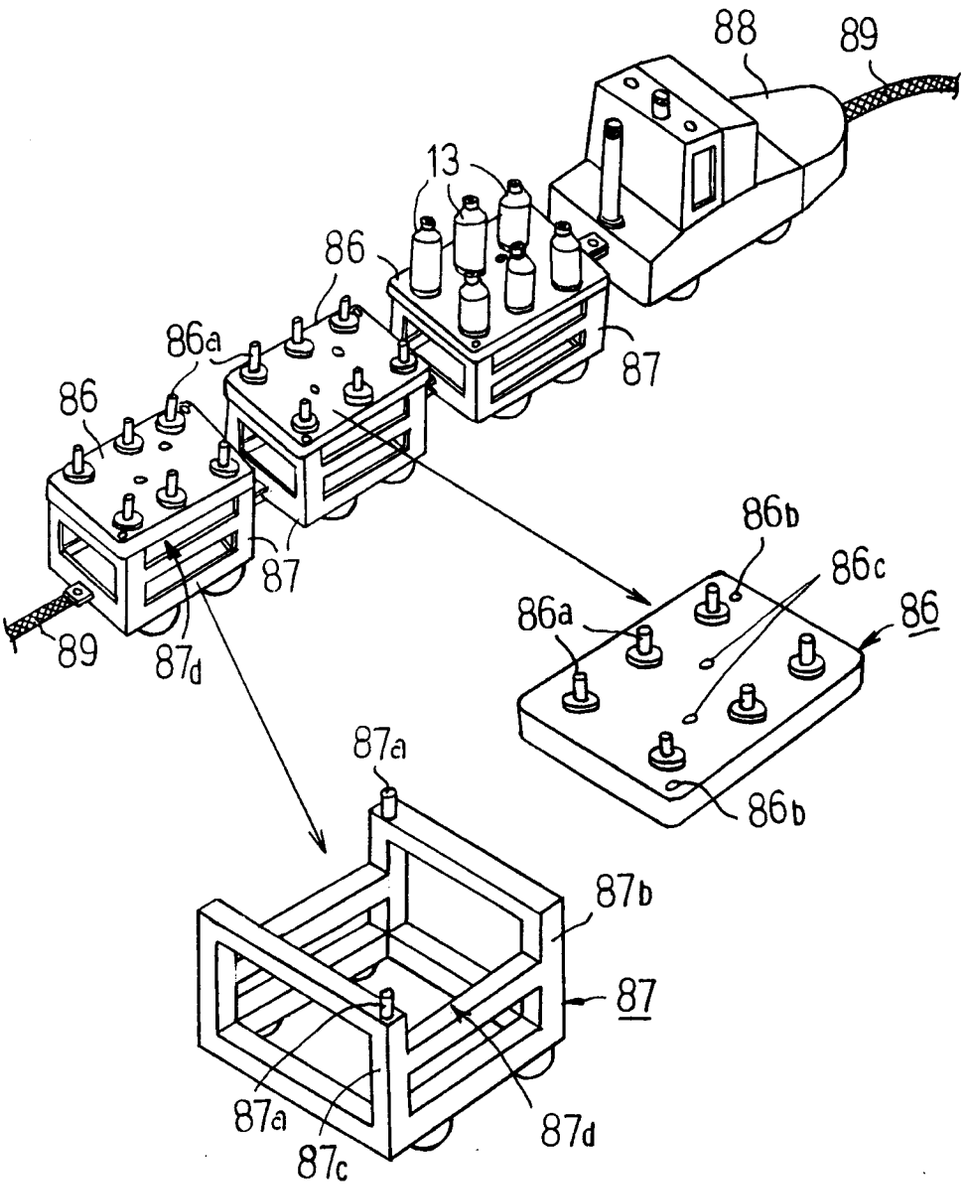
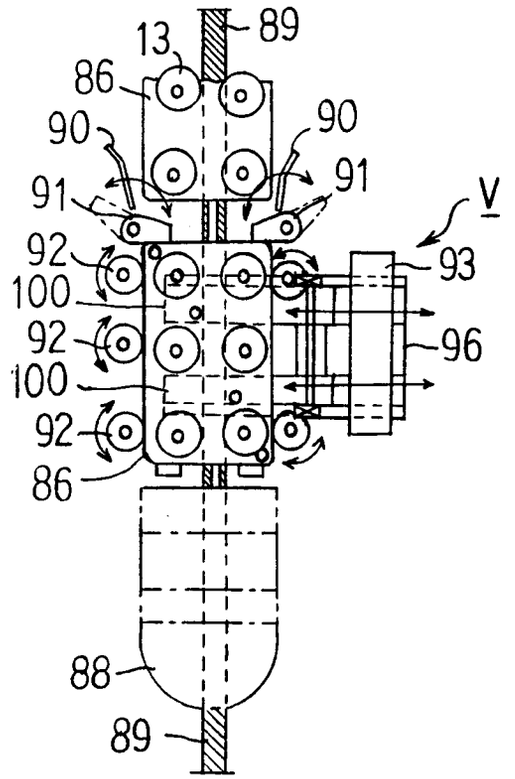

88
89
13
86
86a
87
86
87
89
87d
86b
86c
86a
86
86b
87a
87b
87
87a
87c
87d

FIG 18

(a)


13
89
86
90
90
91
91
V
92
93
100
92
96
100
92
86
88
89

(b)

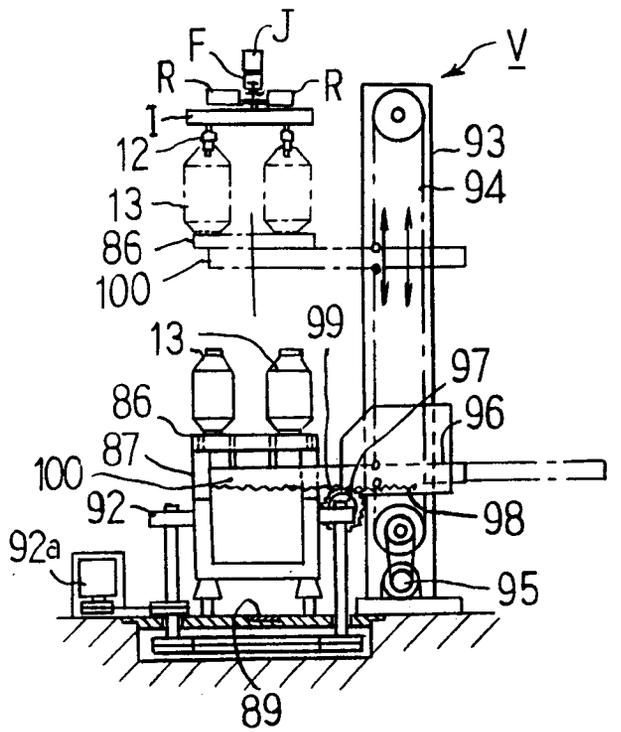

F
J
V
R
R
1
12
93
94
13
86
100
13
99
97
86
96
87
100
92
98
92a
95
89

FIG 19

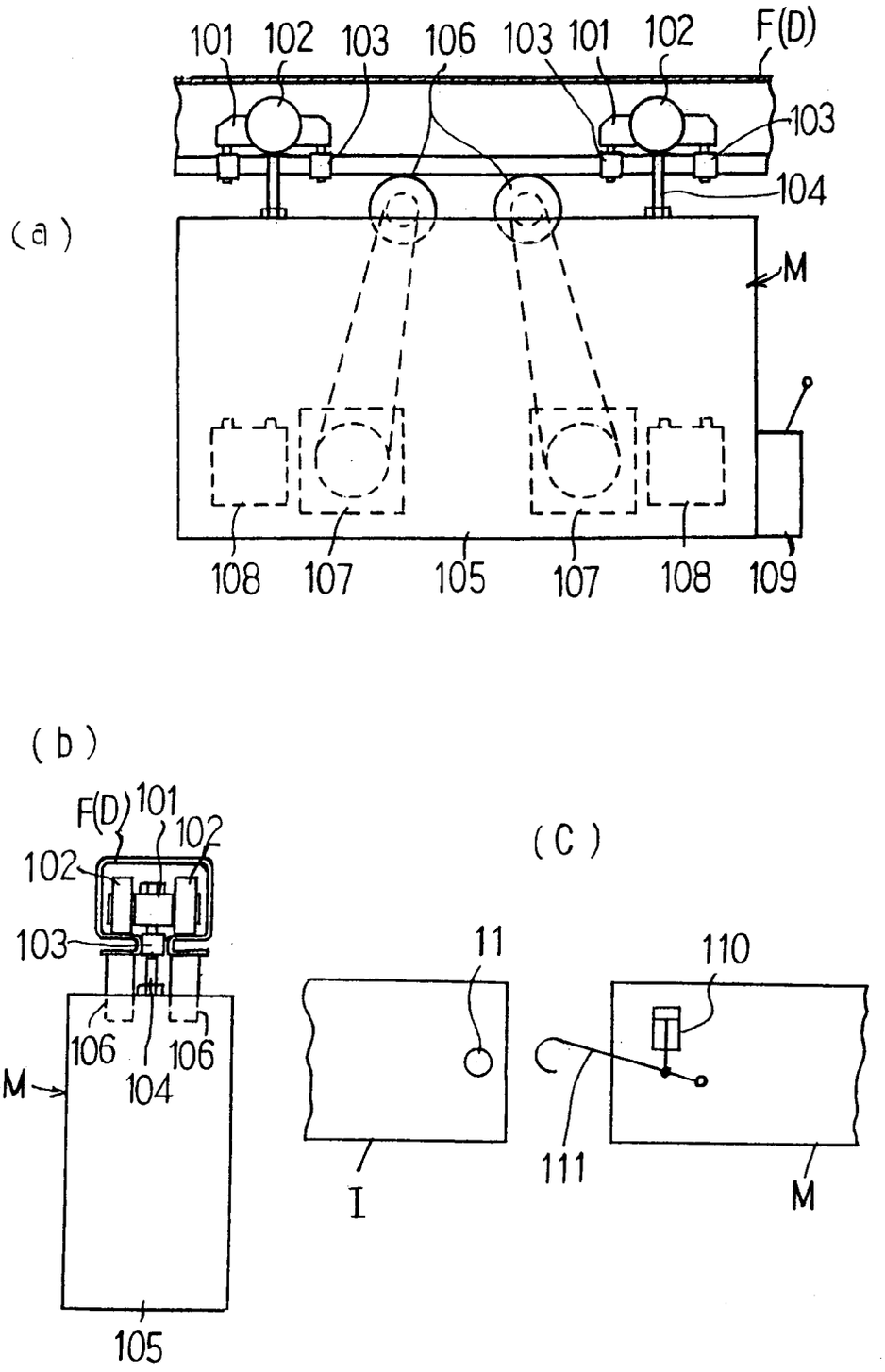

(a)
101
102
103
106
103
101
102
F(D)
103
104
M
108
107
105
107
108
109
(b)
F(D)
101
102
102
103
106
106
104
M
105
(C)
11
I
110
111
M

FIG 20

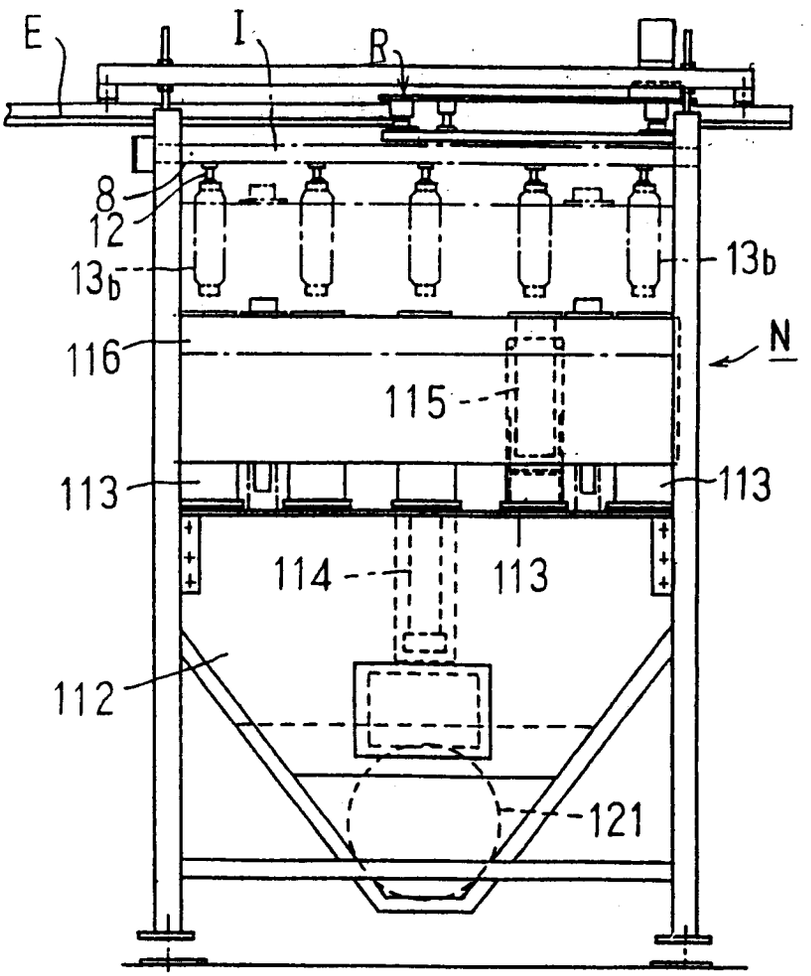


FIG 21

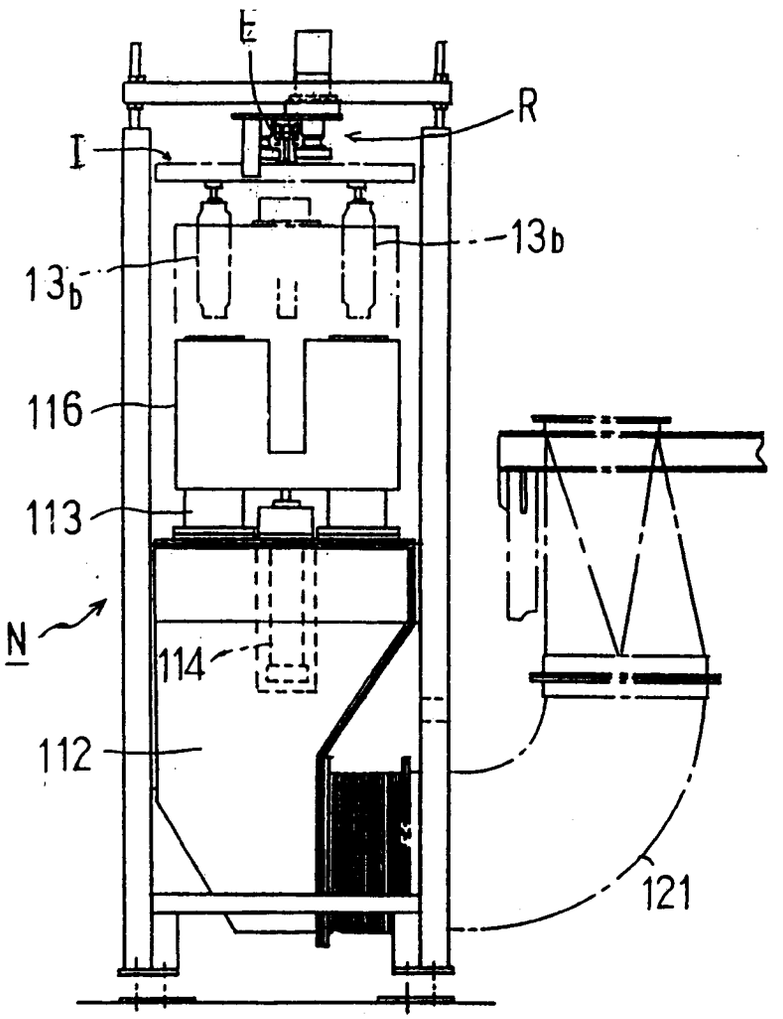


FIG22