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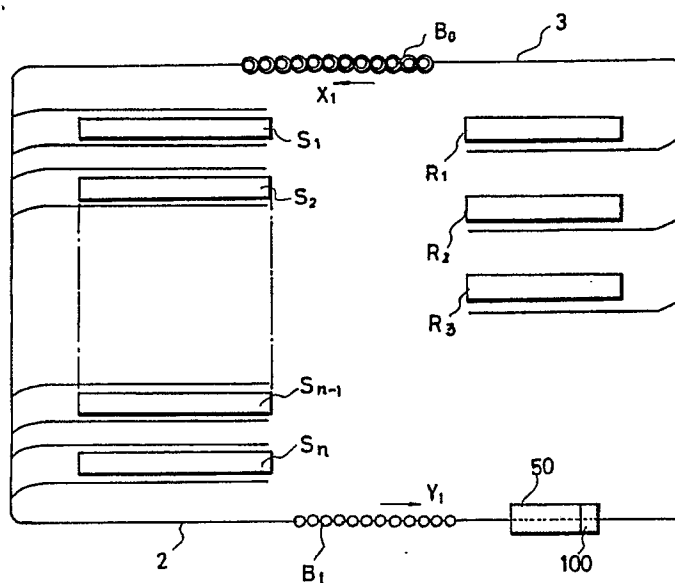
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Roving bobbin carrier system.

A roving bobbin carrier system for conveying roving bobbins between a fine spinning frame (5) and a roving frame (R) in a spinning mill. A suction nozzle type residual roving removing device (50) and a backup device (100) are provided in series in a return line (2) for returning the roving bobbins on

which a residual roving is possibly attached from the fine spinning frame to the roving frame or in a stock line connected to the return line. Accordingly, blank bobbins having no residual roving can be efficiently supplied to the roving frame, and the removal of the residual roving can be full automated.

FIG.1



The present invention relates to a roving bobbin carrier system for supplying roving bobbins on which a roving is wound at a roving frame to a fine spinning frame in a spinning mill and simultaneously returning roving bobbins on which the roving is unwound at the fine spinning frame as blank bobbins to the roving frame.

An automatic roving bobbin carrier system for conveying, the roving bobbins between a group of roving frames and a group of fine spinning frames has been developed to follow automation in the spinning mill. For example, a supply line for supplying the roving bobbins on which the roving is wound is provided between the group of the roving frames and the group of the fine spinning frames, and a return line for returning the roving bobbins on which the roving is unwound is provided between the two groups as a common line to be used with the supply line or an independent line.

However, a residual roving is attached on most of the roving bobbins to be returned to the roving frames, and such roving bobbins cannot be used in the roving frames as they are. Accordingly, a residual roving removing device is provided in a part of the return line or a part of a line branched from the return line. Various types of such a residual roving removing device are known. In one type, a running flock belt is provided to contact the roving bobbins suspended by bobbin hangers for conveying the roving bobbins in the carrier system. In another type, the roving bobbins are released from the bobbin hangers, and are moved near suction slits extending in an axial direction of the roving bobbins to suck the residual roving and unwind the same. Normally, these types of the residual roving removing devices are constructed to collectively treat several to several tens of roving bobbins.

However, as an amount of the residual roving attached on the roving bobbins to be returned from the fine spinning frames is indefinite, all of the residual roving cannot be removed by the residual roving removing device, and there sometimes occurs that the roving bobbins on which the residual roving remains attached are fed downstream of the residual roving removing device. Accordingly, an operator must replace the roving bobbins having the residual roving with blank bobbins, thus hindering automatic conveyance of the roving bobbins.

It is an object of the present invention to provide a roving bobbin carrier system which can efficiently and continuously remove a residual roving attached on the roving bobbins to be conveyed in the return line to the roving frame by using a residual roving removing device capable of efficiently removing the residual roving in a short time.

It is another object of the present invention to provide a roving bobbin carrier system which includes a device for automatically converting into

blank bobbins any of the roving bobbins on which the residual roving is still attached even after passing through the residual roving removing device.

Fig. 1 is a schematic illustration of the carrier system according to a first preferred embodiment of the present invention;

Fig. 2 is a partially cut-away side view of a preferred embodiment of the residual roving removing device used in the carrier system shown in Fig. 1;

Fig. 3 is a partially cut-away top plan view of Fig. 2;

Fig. 4 is a side view of the suction nozzle installed in the residual roving removing device shown in Figs. 2 and 3, illustrating the operation of the suction nozzle;

Fig. 5 is a vertical sectional view of the suction nozzle;

Fig. 6 is a partially cut-away side view of a preferred embodiment of the backup device used in the carrier system shown in Fig. 1;

Fig. 7 is a perspective view of another preferred embodiment of the backup device according to the present invention;

Fig. 8 is a schematic illustration of the carrier system according to a second preferred embodiment of the present invention; and

Fig. 9 is a schematic illustration of the carrier system according to a third preferred embodiment of the present invention.

Referring to Fig. 1 which is a schematic plan view of a general construction of the roving bobbin carrier system according to a first preferred embodiment of the present invention, a plurality of roving frames $R_1, R_2, \dots$ and a plurality of fine spinning frames $S_1, S_2, \dots$ are provided in the same shop. There are provided between a group of the roving frames $R_1, R_2, \dots$ and a group of the fine spinning frames $S_1, S_2, \dots$ a supply line 3 for supplying a plurality of roving bobbins B_0 on which a roving is wound from the roving frames $R_1, R_2, \dots$ to the fine spinning frames $S_1, S_2, \dots$ in a direction X_1 and a return line 2 for returning a plurality of roving bobbins B_1 on which the roving is unwound from the fine spinning frames $S_1, S_2, \dots$ to the roving frames $R_1, R_2, \dots$ in a direction Y_1 . The return line 2 is provided with a residual roving removing device 50 of a suction nozzle type for removing a residual roving from the roving bobbins B_1 and with a backup device 100 for treating or replacing the roving bobbins fed from the residual roving removing device 50, on which roving bobbins the residual roving is still attached, and for supplying the roving bobbins as blank bobbins from which the residual roving is completely removed to the roving frames $R_1, R_2, \dots$. The backup device 100 is located just downstream of the residual roving removing device 50.

Referring to Figs. 2 and 3 which are a partially cut-away side view of the residual roving removing device 50 and a partially cut-away top plan view of Fig. 2, respectively, the roving bobbins B₁ having a residual roving R are suspended by a plurality of bobbin hangers BH, and are carried into the residual roving removing device 50. Under the condition, the roving bobbins B₁ are once stopped. A rotary driving device 51 is provided under each of the roving bobbins B₁. The rotary driving device 51 includes a vertically movable pin 51a to be inserted into a lower hollow portion of the roving bobbin B₁, a rotary driving portion 51b connected to the pin 51a, and a control motor 51c connected to the rotary driving portion 51b for controllably driving the same, so that a rotational speed of the rotary driving portion 51b may be changed.

A plurality of suction nozzles 52 of the same number as the roving bobbins B₁ are provided aside the roving bobbins B₁ in such a manner as to be movable vertically and horizontally toward and away from the roving bobbins B₁. An elongated retainer box 53 is provided to retain the suction nozzles 52 in such a manner that the suction nozzles 52 project toward the roving bobbins B₁. The retainer box 53 is horizontally movably mounted on a guide rail 60, and is driven by a screw shaft 61 and a driving motor 62 in such a horizontal direction as to advance toward and retract from an array of the roving bobbins B₁. The guide rail 60 is mounted on a vertically movable support 55 which is connected to an endless chain 56. The endless chain 56 is connected to a driving motor 57. Accordingly, the retainer box 53 is vertically moved by normally or reversely rotating the driving motor 57.

Referring to Fig. 5 which shows a construction of the suction nozzle 52, a front end portion 52a of the suction nozzle 52 is movably engaged with a front portion of the retainer box 53 through a packing 53a in such a manner as to advance toward and retract from the respective roving bobbin B₁. A hollow bracket 80 is engaged with a rear portion of the retainer box 53, and a rear end portion 74 of the suction nozzle 52 is slidably inserted into the hollow bracket 80. A pressure air inducing portion 76 is formed in an intermediate portion 77 between the front end portion 52a and the rear end portion 74. The intermediate portion 76 is formed at its outer circumference with a continuous groove 78 engaging a pawl 75. The pressure air inducing portion 76 is connected through a flexible hose 72 to a pressure air duct 71, so that a pressure air is supplied from the pressure air duct 71 through the flexible hose 72, and is injected from the pressure air inducing portion 76 toward the rear end portion 74 of the suction nozzle 52. As a result, a suction air flow due to a negative pressure is generated at

the front end portion 52a of the suction nozzle 52, and an end of the residual roving R on the roving bobbin B₁ is sucked into the suction nozzle 52. A nozzle portion of the pressure air inducing portion 76 is preferably inclined at a suitable angle such that the suction air flow is rotated in an untwisting direction of the residual roving R on the roving bobbin B₁, so that the residual roving R is changed into an untwisted fiber Ra as shown in Fig. 4, and the untwisted fiber Ra is discharged through a suction hose 54a connected with the bracket 80 to a collecting device (not shown).

In removing the residual roving on the roving bobbin B₁ by using the residual roving removing device 50 as mentioned above, the retainer box 53 is first moved toward the array of the roving bobbins B₁ in such a manner that the front end portions 52a of some of the suction nozzles 52 advance to contact the blank bobbins, if any, and in this case, the front end portions 52a of the other suction nozzles 52 contacting the roving bobbins having the residual roving are retracted in the retainer box 53. Such a retracted position of the suction nozzles 52 is maintained by the engagement of the pawl 75 with the continuous groove 78. Then, the retainer box 53 is retracted by a distance of 5 - 10 mm, and is then vertically moved as rotating the roving bobbins B₁ at low speeds, thus sucking the end of the residual roving into the suction nozzles 52. Then, as shown in Fig. 2, the retainer box 53 is further retracted to a position 53d, and the roving bobbins B₁ are rotated in an unwinding direction of the residual roving R at high speeds, thus removing the residual roving R from the roving bobbins B₁.

The construction of the residual roving removing device 50 is not limited to the above. For example, the vertical movement and the horizontal movement of the suction nozzles 52 may be effected by any other known moving means. Further, the suction nozzles 52 may be connected to a vacuum pump or the like. As to the method of removing the residual roving, a method of re-removing a residual roving on a flock belt of each roving bobbin may be added, or a method of detecting a residual roving amount with use of a residual roving sensor may be combined with the above-mentioned removing method.

Referring to Fig. 6 which is a partially cut-away side view of the backup device 100, the roving bobbin B₁ suspended by the bobbin hanger BH is carried along a carrier rail 110 in a direction perpendicular to a plane of the sheet of the drawing. A residual roving sensor (not shown) such as an ultrasonic sensor or an optical sensor is provided to detect whether or not a residual roving still exists on the roving bobbin B₁. When the existence of the residual roving is detected, the movement of the

roving bobbin B_1 is temporarily stopped. A lower supporting device 103 is provided just under the roving bobbin B_1 to be stopped in the backup device 100. The lower supporting device 103 is formed at its upper end with a pin 101 to be inserted into the lower hollow portion of the roving bobbin B_1 . On the other hand, one or two fixed rollers 116 and one or two movable rollers 115 which can be moved toward and away from the roving bobbin B_1 by a cylinder 114 are provided at a position corresponding to an upper portion of the roving bobbin B_1 , thus supporting the upper portion of the roving bobbin B_1 . Thus, the roving bobbin B_1 having a residual roving is rotatably supported by the lower supporting device 103 and the rollers 115 and 116. Furthermore, a cutter device 160 is provided aside the roving bobbin B_1 to be stopped in the backup device 100. The cutter device 160 includes a cutter rail 162 pivotably supported to a pin 163 and adapted to be pivoted by a cylinder 165, a vertically movable support 161 mounted on the cutter rail 162 and adapted to be moved vertically by a cylinder 164, and a cutter blade 166 mounted on the vertically movable support 161 for cutting the residual roving on the roving bobbin B_1 .

In operation, the cutter blade 166 is advanced to a position near the outer surface of the roving bobbin B_1 , and the vertically movable support 161 is raised or lowered in a longitudinal direction of the roving bobbin B_1 to thereby cut the residual roving wound on the roving bobbin B_1 in the longitudinal direction. Furthermore, a rotary flock roller 142 pivotably supported to a rotational shaft 141 is brought into contact with the roving bobbin B_1 to peel off the residual roving from the outer circumferential surface of the roving bobbin. The residual raving after peeled off is fed through a suction duct 145 to a collecting device (not shown). Reference numeral 144 designates a driving motor for rotating the flock roller 142.

Referring to Fig. 7 which is a perspective view of another preferred embodiment of the backup device 100, it is primarily constructed of a screw conveyor 113, a residual roving sensor 102 and a bobbin replacing device 120. The roving bobbin B_1 conveyed by the carrier rail 110 is transferred to the screw conveyor 113, and whether or not a residual roving exists on the roving bobbin B_1 is detected by the residual roving sensor 102 located under the screw conveyor 113. When the existence of the residual roving is detected, the screw conveyor 113 is stopped to stop the roving bobbin B_1 at a predetermined position facing the bobbin replacing device 120.

The bobbin replacing device 120 includes a vertically movable member 121 and an arm 124 supported on the vertically movable member 121 and adapted to be engaged with a lower surface of

an upper flange of the roving bobbin B_1 . The arm 124 is connected to a cylinder 125 mounted on the vertically movable member 121, and is adapted to be horizontally moved toward and away from the roving bobbin B_1 by driving the cylinder 125. The vertically movable member 121 is mounted on a metal or synthetic resin belt 133 wrapped between a pair of rollers 131 mounted at upper and lower ends of a movable rail 130. The movable rail 130 is supported through a plurality of rollers 132 to a fixed frame 135, and is adapted to be vertically moved by a cylinder 134 connected to the lower end of the movable rail 130. Accordingly, when a lower portion 134b of the cylinder 134 is expanded, the movable rail 130 is lowered, and the belt 133 is moved to thereby lower the vertically movable member 121. Thus, the roving bobbin B_1 engaging the arm 124 is brought into disengagement from the bobbin hanger BH. The vertically movable member 121 can be moved by a stroke two, three, four, ... times a stroke of the lower portion 134b of the cylinder 134. An upper portion 134a of the cylinder 134 is employed for raising the roving bobbin B_1 by a small amount when the roving bobbin B_1 is disengaged from the bobbin hanger BH.

There are provided under the bobbin replacing device 120 a residual roving removing device and a blank bobbin storing device as shown in Fig. 7, so as to replace the roving bobbin B_1 having a residual roving as released from the bobbin hanger BH with a blank bobbin B_2 . The blank bobbin storing device includes a circulation rail 150 for storing a minimum number of blank bobbins B_2 , and the cutter device 160 and the flock roller 142 as mentioned above are also provided to remove the residual roving from the roving bobbin B_1 lowered by the bobbin replacing device 120.

The backup device 100 may be modified by combining the cutter device with a suction slit type residual roving removing device or by utilizing a chain or belt type bobbin replacing device.

Although the residual roving removing device 50 and the backup device 100 are provided in the return line 2, and they are juxtaposed to each other in the first preferred embodiment, the system of the present invention may be modified to the constructions as shown in Figs. 8 and 9.

Referring to Fig. 8 which shows another preferred embodiment of the present invention, a supply line 3a for supplying the roving bobbins on which a roving is wound is provided between the group of the roving frames $R_1, R_2, \dots$ and the group of the fine spinning frames $S_1, S_2, \dots$ to supply the roving bobbins in a direction X_2 . Furthermore, a bypass line 2a bypassing a part of the supply line 3a is provided to return the roving bobbins used from the group of the fine spinning frames $S_1, S_2,$

... to the group of the roving frames $R_1, R_2, \dots$ in a direction Y_2 . The residual roving removing device 50 and the backup device 100 are provided in the bypass line 2a, and they are arranged in spaced relationship from each other. Accordingly, the roving bobbins having a residual roving are converted into blank bobbins by the residual roving removing device 50 and the backup device 100 in the course of return to the roving frames $R_1, R_2, \dots$. In the case of forming a plurality of different return lines for different kinds of rovings, a plurality of bypass lines similar to the above may be formed, and the residual roving removing device and the backup device may be provided in each of the bypass lines.

Referring to Fig. 9 which shows a further preferred embodiment of the present invention, a common line 5 is provided to convey the roving bobbins from the roving frames $R_1, R_2, \dots$ to the fine spinning frames $S_1, S_2, \dots$ in a direction X_3 and vice versa. Furthermore, stock lines 4a and 4b are connected to the common line 5, and the residual roving removing device 50 and the backup device 100 are provided in the stock lines 4a and 4b, respectively, so as to remove the residual roving from the roving bobbins returned from the fine spinning frames $S_1, S_2, \dots$ in a direction Y_3 to Y_4 . Thus, the roving bobbins are supplied as blank bobbins to the roving frames $R_1, R_2, \dots$. In modification, the residual roving removing device 50 and the backup device 100 may be directly provided in the common line 5 without forming the stock lines 4a and 4b.

As described above, the carrier system of the present invention is provided with the suction nozzle type residual roving removing device and the backup device which can exhibit a high efficiency of removal of the residual roving. Accordingly, these devices can be located at an appropriate position in the return line for returning the roving bobbins from the fine spinning frames to the roving frames, and the roving bobbins can be conveyed efficiently as removing the residual roving. Further, as a fully automatic machine can be utilized for the above devices, labor saving can be achieved.

Claims

1. Roving bobbin carrier system including a supply line (3) for conveying a plurality of first roving bobbins (B_0) on which a roving is wound from a roving frame (R) to a line spinning frame (5) and a return line (2) for conveying a plurality of second roving bobbins (B_1) on which said roving is unwound from said fine spinning frame to said roving frame, **characterized** by a residual roving removing device (50) of a suction nozzle type provided in said return line (2) or a stock line

connected to said return line for removing a residual roving attached to said second roving bobbins, and a backup device (100) provided in said return line (2) or said stock line at a position downstream of said residual roving removing device for converting into blank bobbins any of said second roving bobbins on which said residual roving is still attached even after passing through said residual roving removing device.

2. Roving bobbin carrier system as claimed in claim 1, **characterized** in that said return line is formed as a bypass line (2a) bypassing a part of said supply line (3a).

3. Roving bobbin carrier system as claimed in claim 1 or 2, **characterized** in that said return line is formed as a common line (5) to be commonly used with said supply line.

4. Roving bobbin carrier system as claimed in one of claims 2 to 3, **characterized** in that said residual roving removing device comprises a rotary driving device (51) for rotationally drivably supporting said second roving bobbins (B_1) and a suction nozzle (52) provided aside said second roving bobbins in such a manner as to be movable toward and away from said second roving bobbins and also movable in an axial direction of said second roving bobbins (B_1).

5. Roving bobbin carrier system as claimed in claim 3, **characterized** in that said suction nozzle is formed with a pressure air nozzle portion (76) for injecting a pressure air toward a rear portion of said suction nozzle (52), said pressure air nozzle portion being so constructed as to form an air flow rotating in an untwisting direction of said residual roving.

6. Roving bobbin carrier system as claimed in claim 4, **characterized** in that said suction nozzle (52) is connected to a vacuum pump.

7. Roving bobbin carrier system as claimed in one of claims 4 to 6, **characterized** by a retainer box (53) for retaining a plurality of said suction nozzles (52) arranged in juxtaposition to each other.

8. Roving bobbin carrier system as claimed in one of claims 1 to 3, **characterized** in that said backup device (100) comprises a supporting device (110, 103) for rotatably supporting said second roving bobbins suspended by bobbin hangers (BH), a cutter device (160) for cutting said residual roving in an axial direction of said second roving bobbins, and a rotary flock roller (142) for peeling off said residual roving cut by said cutter device.

9. Roving bobbin carrier system as claimed in one of claims 1 to 3, **characterized** in that said backup device (100) comprises a bobbin replacing device (120) for replacing said second roving bobbins with said blank bobbins and attaching said blank bobbins to bobbin hangers.

10. Roving bobbin carrier system as claimed in claim 9, **characterized** by a second residual roving removing device provided under said bobbin replacing device, said second residual roving removing device comprising a circulation rail, a cutter device and a rotary flock roller (142). 5

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FIG.1

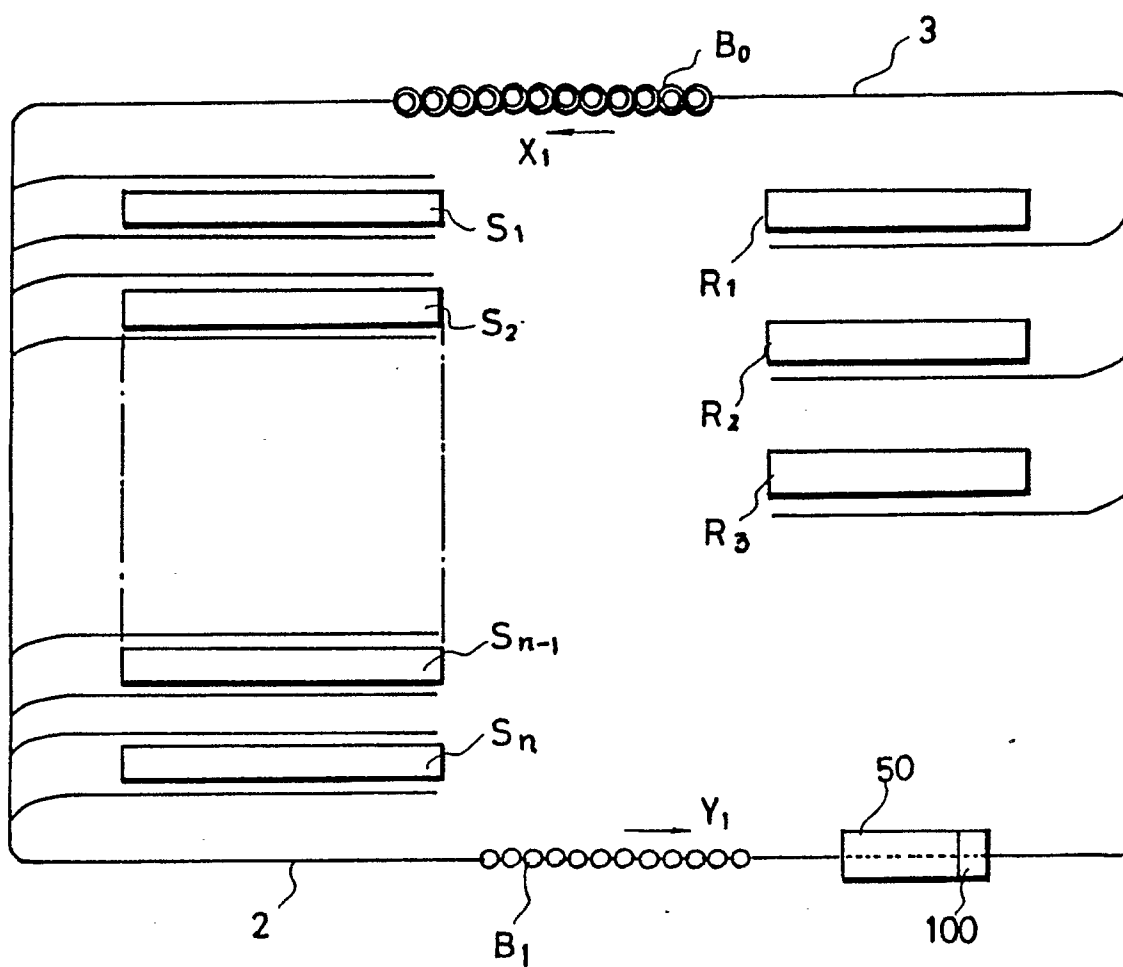


FIG.2

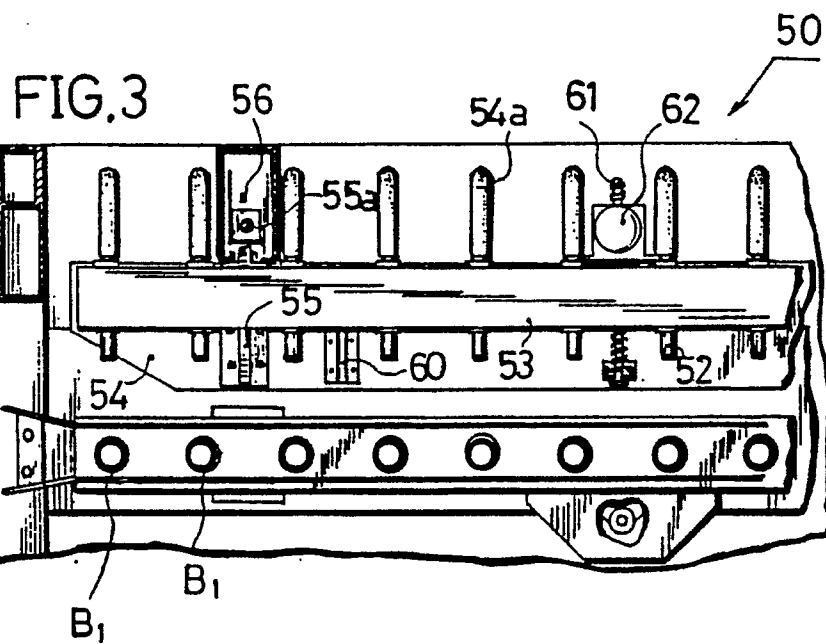
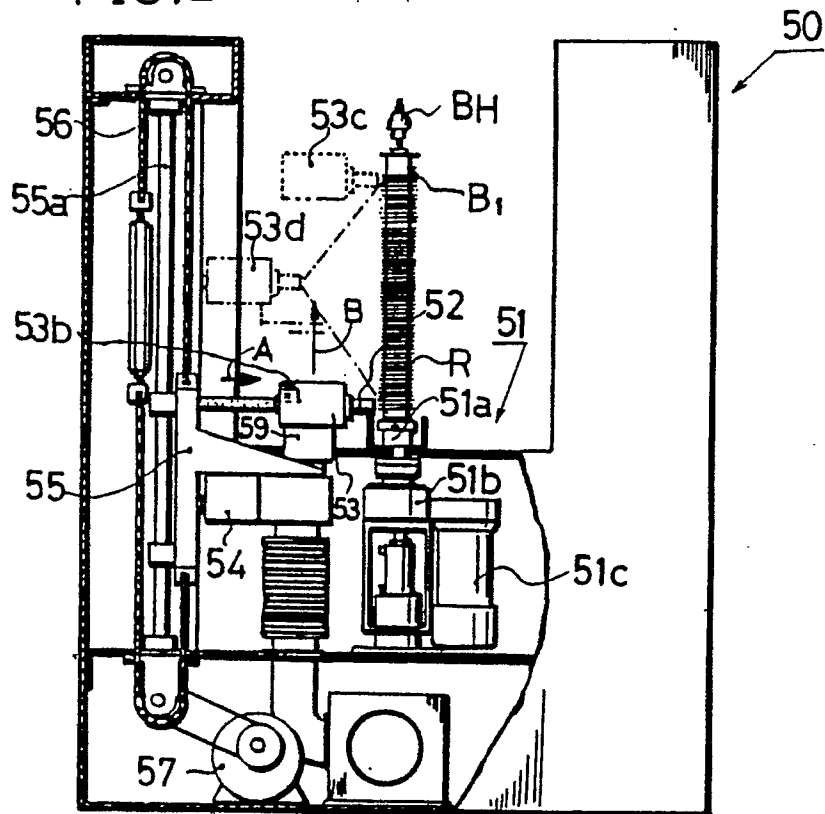


FIG.4

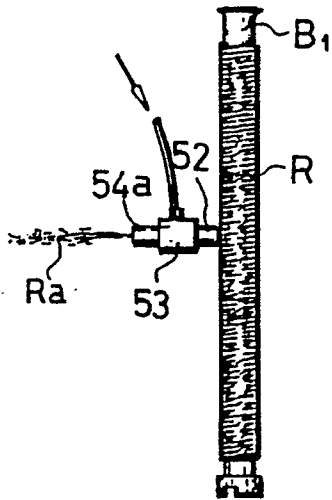


FIG.5

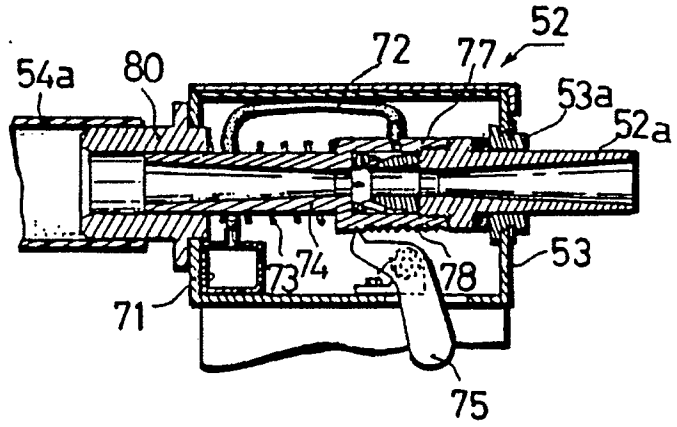


FIG.6

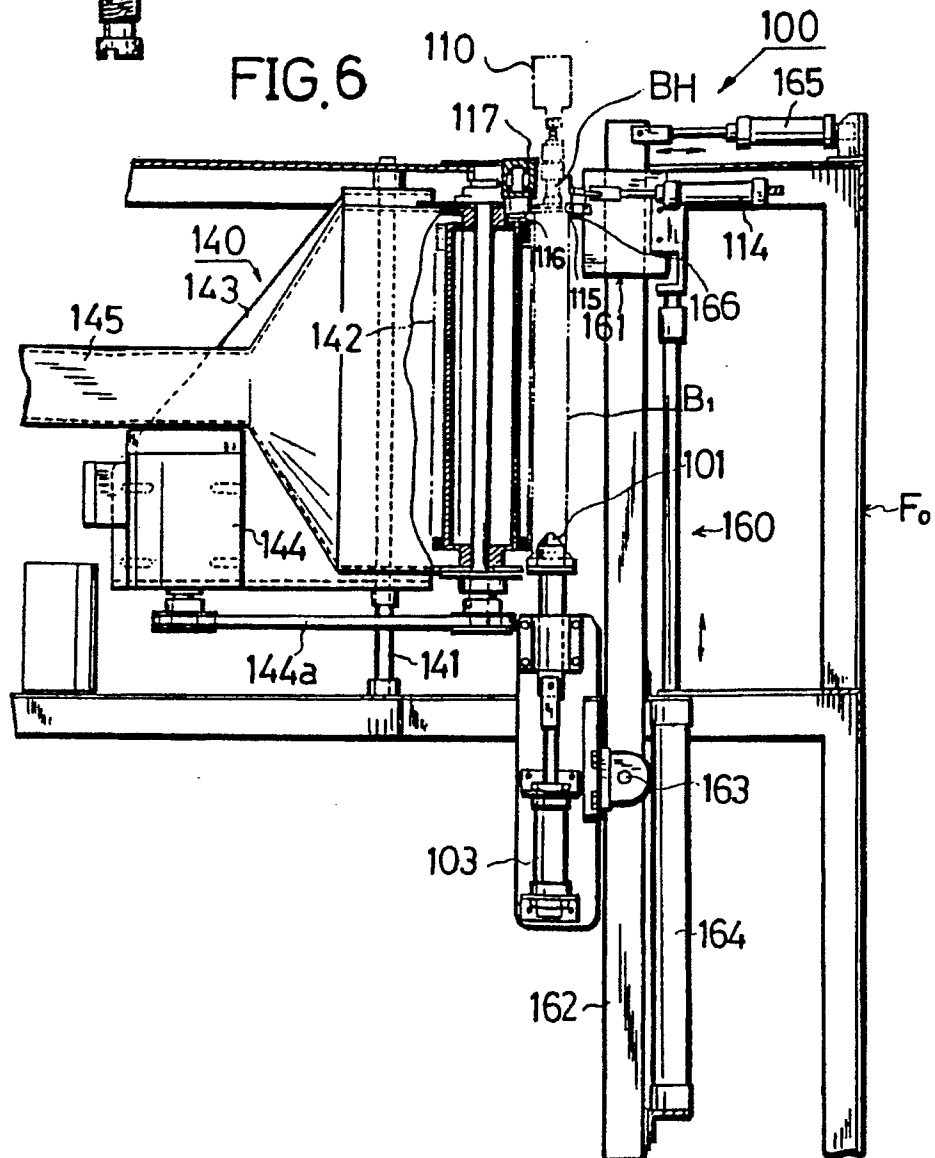


FIG.7

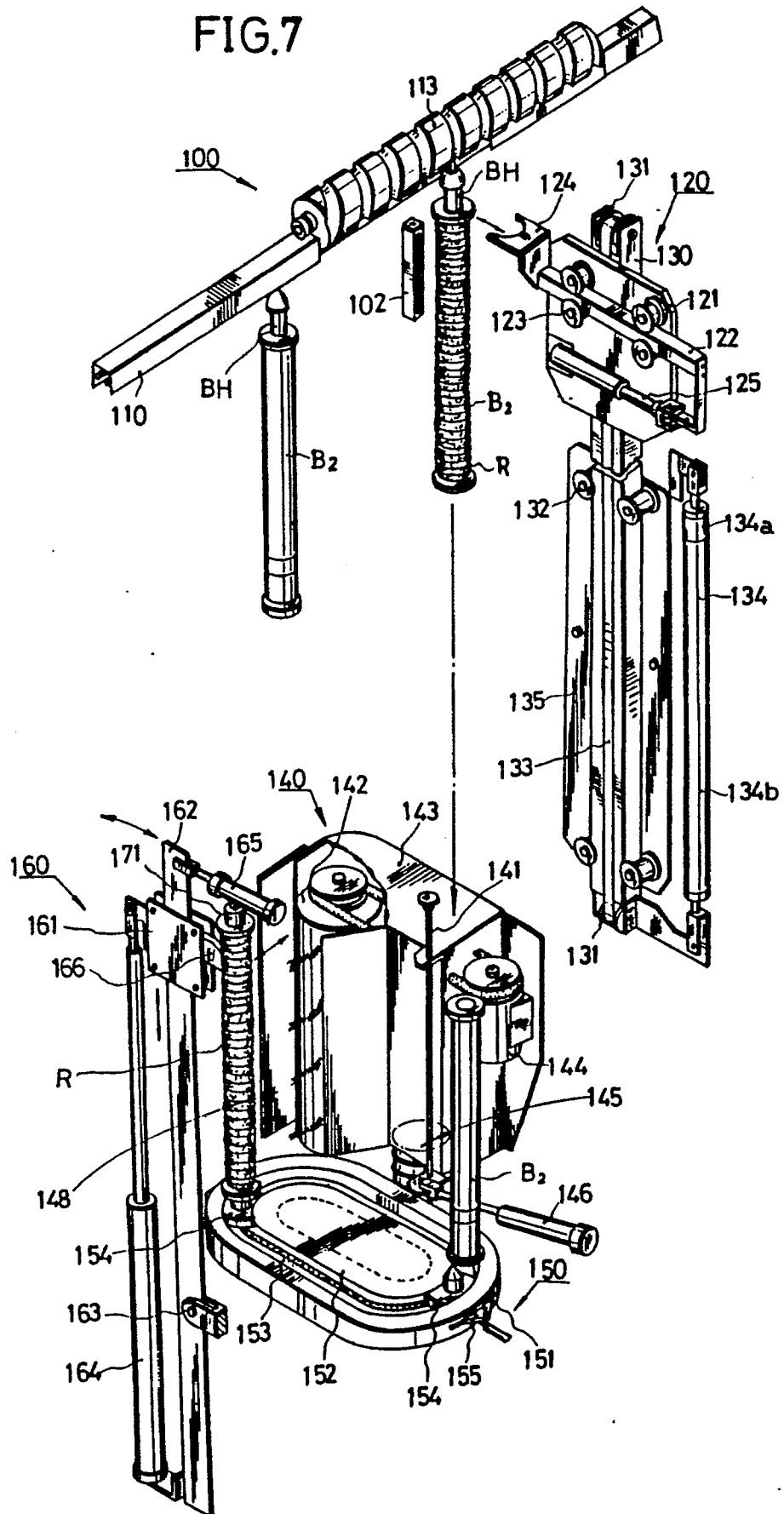


FIG.8

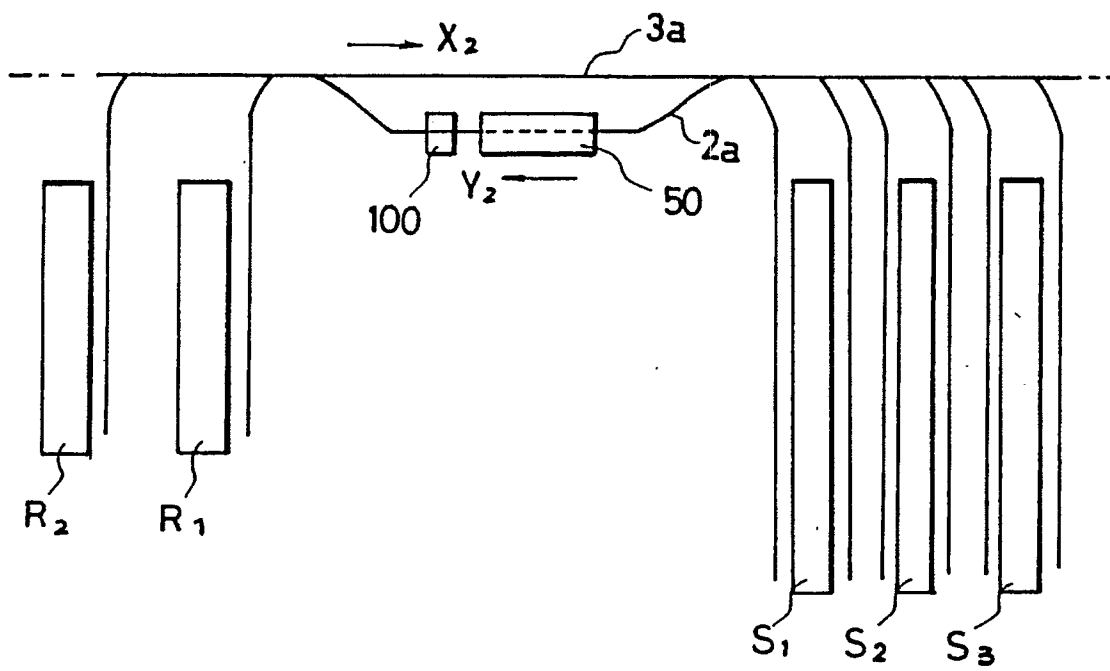
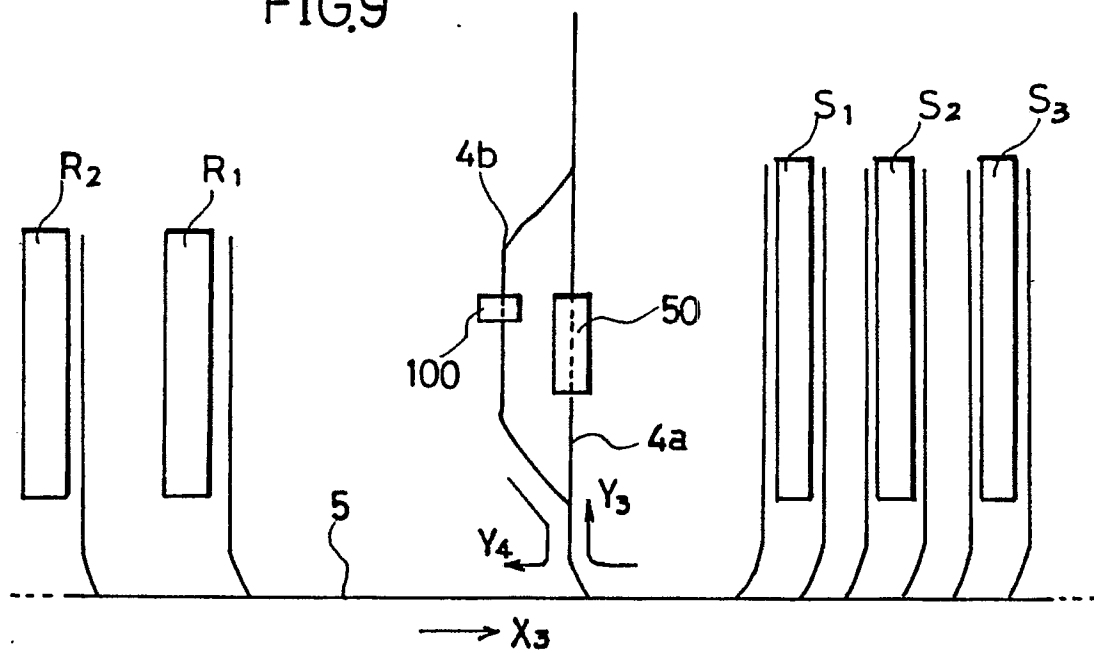


FIG.9





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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 262 (C-442)(2709) 25 August 1987, & JP-A-62 062932 (HOWA MACH LTD) * the whole document *	1, 2	D01H9/18 D01H1/38 B65H73/00
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 187 (C-592)(3535) 02 May 1989, & JP-A-01 014329 (TOYOTA AUTOM Loom WORKS LTD) * the whole document *	1	
A	EP-A-307806 (KABUSHIKI_KAISHA TOYODA JIDOSHOKKI SEISAKUSHO) * column 5, line 53 - column 6, line 21; figure 1 *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 151 (C-584)(3449) 12 April 1989, & JP-A-63 309632 (MURAO BOKI K.K.) * the whole document *	4	
A	US-A-3910021 (L.B.VAN PETTEN) * column 3, line 10 - column 4, line 4; figures 1, 6 *	4-6	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 237 (C-305)(1960) 24 September 1985, & JP-A-60 094628 (MURAO BOUKI K.K.) * the whole document *	4	D01H B65H
A	EP-A-318435 (BALTEC MASCHINENBAU AG) * claim 1 *	8	
A	DE-A-2947808 (B.V.MASCHINEFABRIEK M. BROUWER & CO) * page 7, lines 5 - 23 *	5	
-/-			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 AUGUST 1990	Examiner HOEFER W.D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document I : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application F : document cited for other reasons & : member of the same patent family, corresponding document			



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 333 (C-526)(3180) 08 September 1988, & JP-A-63 092735 (MURAO BOKI K.K.) * the whole document *		
A	EP-A-259880 (MURAO BOKI K.K.)		
A	EP-A-219129 (MURAO BOKI K.K.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 AUGUST 1990	Examiner HOEFER W.D.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	