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(54) Lead yarn drawing device for a yarn tube.

(57) In a lead yarn drawing device for a yarn tube having a yarn suction duct for drawing a lead yarn of the yarn tube through an open end of a suction portion, yarn pinching means, which is adjacently opposed to an interior of the suction portion of the yarn suction duct or is formed of a pair of rollers, and closing means formed of a flexible plate are disposed in the suction portion of the yarn suction duct. The yarn pinching means attracts the yarn into the suction portion and pinches the same, and the closing means closes the open end.

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a device for drawing out a lead yarn from a yarn tube in an operation for automatically supplying a yarn tube, which is finished by a fine spinning frame in a spinning step, to a winder, and in particular, to a lead yarn drawing device which can be effectively used for the yarn tube of which lead yarn cannot be facilely drawn out in the prior art.

Description of the Background Art

In order to efficiently drawing out a lead yarn from a yarn tube, there have been proposed or used several methods. In one of the methods, high pressure air is injected against a surface layer of a yarn tube by an air compressor. In another method, the surface layer of the yarn tube is beaten with a flexible plate made from, e.g., rubber or synthetic resin and referred to as a "beater" for disentangling and drawing out the yarn. In still another method, a hook-like piece made from, e.g., metal or synthetic resin is pushed against the surface layer of the yarn tube to hook and draw out the lead yarn.

However, the foregoing methods have following disadvantages. In the method of injecting the high pressure air against the surface layer of the yarn tube by the air compressor, a force acting on the lead yarn is relatively small, and thus a force for disentangling and drawing out the yarn is limited.

In the method of beating the surface layer of the yarn tube with the beater, i.e., the flexible plate of rubber and metal, the yarn at the surface layer of the yarn tube is physically damaged. Although the beater is made from relatively soft material for reducing the damage, a sufficient effect cannot be obtained. It often takes a long time for drawing out the lead yarn. Further, since the beater made from the relatively soft material may be rapidly worn, and thus is not suitable to a long-term use.

In the method of pressing the hook-like piece of metal or resin against the surface layer of the yarn tube, a remarkably strong force can be utilized for disentangling and drawing out the yarn. However, the yarn at the surface layer of the yarn tube is physically damaged to a relatively large extent.

As stated above, the method of a so-called non-contact type, in which any member does not contact the surface layer of the yarn tube, causes a disadvantage relating to the ability to draw out the lead yarn. The method of a contact type, in which the piece of the like contacts the surface layer of the yarn tube, is liable to physically damage the yarn at the surface layer of the yarn tube, which may reduce the quality of the yarn. Therefore, it has been required to provide a lead yarn drawing device of a non-contact type which has a strong ability to draw out the lead yarn of the yarn tube.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a lead yarn drawing device for a yarn tube having a yarn suction duct for drawing a lead yarn of the yarn tube through an open end of a suction portion, in which yarn pinching means which is adjacently opposed to an interior of the suction portion of the yarn suction duct or is formed of a pair of rollers, and closing means formed of a flexible plate are disposed in the suction portion of the yarn suction duct, the yarn pinching means attracts the yarn into the suction portion and pinches the same, and the closing means closes the open end.

The yarn reaching at the vicinity of the open end is facilely attracted into the suction portion through a space in the yarn holding means which is adjacently opposed to the suction portion. When the yarn is detected, the pinching means opposed thereto contacts the same to firmly pinch the yarn, and the lower end of the flexible plate lowers to close the open end.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view showing a lead yarn drawing device for a yarn tube according to the invention in a yarn drawing state;

Figure 2 is a side view specifically illustrating a yarn suction duct of a lead yarn drawing device for a yarn tube according to the invention;

Figure 3 is a cross section taken along line III-III in Figure 2 illustrating a lead yarn drawing device according to a first embodiment of the invention with an end of an open portion in an open state;

Figure 4 is a cross section taken along line III-III in Figure 2 illustrating a lead yarn drawing device according to a first embodiment of the invention with an end of an open portion in a closed state;

Figure 5 is a cross section taken along line III-III in Figure 2 illustrating a lead yarn drawing device according to a second embodiment of the invention with an end of an open portion in an open state;

Figure 6 is a cross section taken along line III-III in Figure 2 illustrating a lead yarn drawing device according to a second embodiment of the invention with an end of an open portion in a closed state; and

Figure 7 is a side view illustrating a lead yarn drawing device for a yarn tube according to the invention in a state that a lead yarn is drawn.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Embodiments of the invention will be described below in detail with reference to the drawings. Figure 1 shows a lead yarn drawing device 1 for a yarn tube according to the invention. "2" indicates a yarn tube finished by a fine spinning frame. "3" indicates a yarn suction duct which is supported by a supporting device (not shown) for a vertical movement as well as a lateral movement relative to the yarn tube 2. The duct 3 is connected to a suction blower (not shown) through a flexible duct 6 and a collecting dust 8. Figure 1 illustrates a yarn drawing state, in which an open end 42 of the yarn suction duct 3 is approached to a surface layer 21 of the yarn tube 2 for drawing yarn portion 20 pulled out from the yarn tube 2.

"9" indicates a lead yarn pulled out from the yarn tube 2. A tray 10 carries the yarn tube 2 in a standing position, and is provided with a vent 10A formed at a core portion of a peg fitted into the yarn tube 2. A lower duct 7 is disposed to connect the lower portion of the tray 10 and the collecting duct 8. "19" indicates a shutter for controlling communication between the lower duct 7 and the collecting duct 8. The shutter 19 is operated by an unillustrated pneumatic cylinder, solenoid or the like.

Figure 2 is a side view specifically showing the yarn suction duct 3 located along a lengthwise direction of the yarn tube 2. The yarn suction duct 3 is formed of a suction portion 4, which is approached to the yarn tube 2 for drawing the lead yarn 9, and a main body 5 connected to the flexible duct 6. An end of the suction portion 4 adjacent to the yarn tube 2 forms an open end 42. A plane 43 of the open end 42, which is visible in a side view of the open end 42, is of spindle-shape substantially similar to a side configuration of the surface layer 21 of the yarn tube 2.

"31A" and "31B" indicate a light emitter and a light receiver of an optical sensor, respectively, which are disposed at opposite sides in a lengthwise direction of the suction portion 4 and serve as a sensor for sensing the yarn. The light emitter 31A includes a light emitting diode and an optical lens for emitting a light beam to the light receiver 31B. "32A" and "33A" indicate light emitters of optical sensors having structures similar to that of the emitter 31A. "32B" and "33B" indicate light receivers of optical sensors having structures similar to those of the receiver 31B. The light emitters 31A, 32A and 33A and the light receivers 31B, 32B and 33B form an optical sensor group 13 for sensing the yarn.

Each pair of the emitter 31A (32A or 33A) and receiver 31B (32B or 33B) are fixed with their optical axes completely coincident with each other. The positions of the emitters and receivers may be replaced with each other. Naturally, in order to prevent crossing of the beams, which may cause malfunction due to the interference, frequencies of the respective emitters are differed from each other, or the emitters alternately emit the beams in pulse-like forms.

Figure 3 is a cross section taken along line III-III in Figure 2 showing the first embodiment. The yarn drawing duct 3 is of a box-like form, and has the wide main body 5 and the narrow suction portion 4. The inner space of the suction portion 4 forms an open portion 41 having an open end 42. During the operation, the suction portion 4 is located to oppose the open end 42 to the yarn tube 2. In connection with this, the open end 42 of the suction portion 4 has the configuration substantially similar to that of the surface layer 21 of the yarn tube 2, as described below. An inner wall 51 is formed at a stepped portion between the main body 5 and the suction portion 4. A yarn pinching member 11 is located in the open portion 41, and is moved in a direction along a smaller width of the portion 41 by a pneumatic cylinder 12, so that it contacts or is separated from a pinching surface 44, i.e., an inner surface of the open portion 41 opposite thereto. "14" indicates flexible synthetic rubber in a plate-like form, having one end fixed to the surface of the yarn pinching member 11 opposed to the pinching surface 44, and the other end fixed to the inner wall 51 by a fastener such as a rivet. As the yarn pinching member 11 moves forward or rearward, the end 42 of the open portion is closed or opened. The yarn pinching member 11 and the synthetic rubber 14 form a yarn pinching portion 16.

Figure 4 is a cross section similar to that of Figure 3 except for that, in Figure 4, the end 42 of the open portion of the yarn suction duct 3 is closed and the yarn suction duct 3 is separated from the vicinity of the yarn tube 2 to some extent. In the yarn drawing state shown in Figure 1, the yarn tube 2 is rotated as indicated by an arrow a in Figure 2, and the unillustrated suction blower is operated to draw the air through the end 42 of the open portion, so that the lead yarn 9 of the yarn tube 2 is drawn together with the air through the end 42 of the open portion. When the yarn portion

20 near the end of the lead yarn 9 is drawn into the open portion 41, the optical yarn sensor group 13 detects it, so that the pneumatic cylinder 12 extends its rod and the yarn is pinched by the yarn pinching member 11. When the yarn pinching member 11 is moved forward to contact the pinching surface 44 for pinching the yarn portion 20 therebetween, the synthetic rubber 14 intimately contacts the pinching surface 44, so that the yarn portion 20 is firmly pinched, as is intended in the invention. In the operation for pulling out the lead yarn 9 from the yarn tube 2, the end of the lead yarn 9 may be insufficiently pulled out only by a small length, e.g., from 5mm to 10mm due to fluff-entangling with the yarn at the surface layer 21. Even in this case, the lead yarn 9 can be firmly pinched.

When one end of the synthetic rubber 14, of which other end is fixed to the inner wall 51, intimately contacts the pinching surface 44 of the open portion 41, the yarn suction duct 3 is completely closed so that the air cannot flow through the end 42 of the open portion. In this state, if the yarn suction duct 3 is moved away from the vicinity of the yarn tube 3 to a small extent, the lead yarn 9 is pulled out from the yarn tube 2, and the yarn suction duct 3 can be moved upwardly from the moved position, because a projection 45 (see Figure 2) of the suction portion 4 does not interfere with the surface layer 21 of the yarn tube 2.

The optical yarn sensor group 13 senses the entry of the yarn portion 20 of the lead yarn 9 into the open portion 41, and controls the pneumatic cylinder 12 to extend its rod, so that the yarn portion 20 of the lead yarn 9 is completely pinched. Since the yarn tube 2 is rotating, the lead yarn 9 can be surely pulled out from the yarn tube 2.

Figure 5 is a cross section taken along line III-III in Figure 2 and showing a second embodiment. The yarn suction duct 3 is of a box-like form having a square cross section. The body portion 5 has a large width in a direction of a diameter of the yarn tube 2 opposed thereto. The suction portion 4 has a small width in the same direction. The side wall 51 is formed at the stepped portion between these wide and narrow portions.

In the suction chamber 41 of the suction portion 4, there is provided a pair of rollers 23, which form the yarn pinching means 16, with their axis parallel to each other. The rollers 23 are juxtaposed in the widthwise direction of the suction portion 4, and their peripheral surfaces are adjacently opposed to each other. The roller 23 located in the lower side in the figure is supported by a roller support member 24 on a bottom surface 44 of the suction chamber 41. The upper roller 23 is supported by a roller support member 24 fixed to a roller seat 25R, which is vertically moved by the pneumatic cylinder 12, so that the peripheral surfaces of the rollers 23 can contact and move away from each other. When not used, the upper roller 23 is located at a raised position to form a space between the rollers 23.

A major component of the closing means 22 is the flexible plate 14 formed of the synthetic resin or the like, and has a lengthwise length equal to the lengthwise length of the open end 42. A support member 25 is formed of a nearly Z-shaped metal plate having an upper portion, which forms the roller seat 25R projected horizontally toward the open end 42, a lower portion, which forms a flexible plate mounting portion 26P projected horizontally toward the main body 5, and a middle portion forming a connecting portion 26, which connects the upper and lower portions. The flexible plate mounting portion 26P has the lengthwise length equal to the lengthwise length of the flexible plate 14. The flexible plate 14 is fixed at its horizontal portion near its end to the lower surface of the flexible plate mounting portion 26P, and is fixed at its portion near the upper end to the side wall 51 by the fastener 15 such as a rivet. Since the flexible plate mounting portion 26P is located at the raised position when not used, the members and portions are designed to form a space between the lower surface of the flexible plate 14 near its lower end and the bottom surface 44 so as to maintain the open end 42 at the open state.

In the yarn drawing state shown in Figure 1, the yarn tube 2 is rotated as indicated by the arrow a in Figure 2, and the suction blower is operated. Thereby, the lead yarn 9 pulled out from the yarn tube 2 is drawn together with the air through the open end 42. The yarn portion 20 of the lead yarn 9 near its end is drawn into the space between the rollers 23 and is guided by the rollers 23, so that it is extremely smoothly attracted into the suction chamber 41.

The end of the yarn portion 20 which has entered the suction chamber 41 is detected by the optical yarn sensor group 13, and the unillustrated control unit controls the pneumatic cylinder 12 to extend its rod, whereby the upper lower 23 on the roller seat 25R lowers to contact and press the lower roller 23 with the yarn portion 20 therebetween. This pressing operation ensures the pinching of the yarn, and thus, in the operation for pulling out the lead yarn 9 form the rotating yarn tube 2, the yarn can be facilely pulled out even in such a case that, initially in this operation, the end portion of the lead yarn 9 could not be pulled out sufficiently due to the fluff entanglement thereof with the yarn at the surface layer 21 and thus could be pulled out only by about 5mm - 10mm.

Figure 6 is a cross section similar to Figure 5 but illustrates the closed state of the open end 42. The flexible plate mounting portion 26P lowers together with the upper roller 23, and the lower surface of the flexible plate 14 near its end contacts the bottom surface 44 prior to the mutual contact of the rollers 23. Since the flexible plate 14 is fixed at the portion near its upper end to the side wall 51, the open end 42 is closed when the lower surface near the lower end contacts the bottom surface 44 of the suction chamber 41, so that the yarn suction duct 3 cannot draw the air any longer. The section of the connecting portion 26 of the support member 25 is bent for obtaining a spring effect, by which the lower surface of the flexible plate 14 near the lower end is intimately pressed to the bottom surface 44. In Figure 6, there is also illustrated a state in which the closed yarn suction duct 3 is slightly moved away from the yarn tube 2 and thus the lead yarn 9 is pulled out from the yarn tube 2 to a further extent.

When the yarn suction duct 3 is moved away from the vicinity of the yarn tube 2 to a small extent, the projection 45 of the suction portion 4 (see Figure 2) is prevented from interfering with the surface layer 21 of the yarn tube 2, so that the yarn suction duct 3 can move upwardly without a further lateral movement. Figure 7 illustrate a state in which the yarn suction duct 3 pinching the yarn portion 20 is located at a raised position above the yarn tube 2 and thus the yarn 9 is pulled out upwardly through a long length, as indicated by a pulled long yarn 91. The yarn 91 is fixed by a tool or yarn holder 17 at the upper portion of the bobbin of the yarn tube 2, and a yarn cutter 18 cuts it into a predetermined length. The lead yarn 9 extending downwardly from the cut point lowers and is drawn into a top hole at the upper portion of the bobbin of the yarn tube 2 by the air supplied by the suction blower. The lead yarn 9 passes through a through-hole in the bobbin, and is further introduced through the vent 10A of the tray 10 and the lower duct 7 into the collecting duct 8 for winding the same by the unillustrated winder. Therefore, the lead yarn 9 wound around the yarn tube 2 is completely pulled out and transferred to the winder.

As described above, the yarn suction duct 3, which draws and pulls out the lead yarn 9 from the yarn tube 2, is connected through the flexible duct 6 to the collecting duct 8, and the vent 10A of the tray 10, through which the lead yarn 9 is drawn through the top opening of the bobbin of the yarn tube 2, is connected through the lower duct 7 to the collecting duct 8. The flexible duct 6 and the lower duct 7 disposed in parallel are selectively used. Thus, in the operation for drawing and pulling out the lead yarn 9 of the yarn tube 2 by the yarn suction duct 3, the shutter 19 for the lower duct 7 is closed, so that the whole suction power is concentrated to the yarn suction duct 3 to increase the drawing efficiency of the lead yarn 9. On the other hand, in the operation for drawing the lead yarn 9 through the lower duct 7 and the top hole of the bobbin of the yarn tube 2, it is necessary to close the yarn suction duct 3 for increasing the suction force through the top hole of the bobbin of the yarn tube 2 so that the collecting ratio of lead yarn 9 in the top hole may be increased. For this purpose, a shutter device is required for the flexible duct 6. However, a dedicated shutter is not required because the open end 42 of the yarn suction duct 3 is automatically closed by the flexible plate 14 simultaneously with the pinching of the yarn portion 20.

Since the yarn pinching means 16 includes the yarn pinching member 11 or the rollers 23, the structures can be simple. Since the open end 42 is closed simultaneously with the pinching of the yarn portion 20 by the yarn pinching member 11 or the rollers 23, it is not necessary to dispose the dedicated shutter device in the flexible duct 16, which also simplifies the structures. The present invention is not restricted to the illustrated embodiments, and, of course, structures and designs may be partially modified without departing from the spirit and scope of the present invention.

Since the yarn which is being drawn into the yarn suction duct is guided by the yarn pinching member or the paired rollers, the guide can be carried out very smoothly, and the yarn can be surely pinched. When the yarn is pinched, the flexible plate automatically closes the open end of the yarn suction duct, so that the simple structures and reliable operation can be achieved. Since the open end is closed, it is not necessary to provide the dedicated shutter in the flexible duct.

Claims

1. A lead yarn drawing device for a yarn tube having a yarn suction duct for drawing a lead yarn of the yarn tube through an open end of a suction portion, in which a configuration of the open end of the suction portion of the yarn suction duct is substantially similar to that of a surface layer of the yarn tube, yarn pinching means and closing means formed of a flexible plate are disposed in the suction portion, said yarn pinching means is adapted to draw and pinch the yarn into the suction portion, and said open end of said suction portion is adapted to be closed by said flexible plate when said yarn is pinched.

2. A lead yarn drawing device for a yarn tube according to claim 1, wherein said yarn pinching means in said suction portion is replaced by yarn pinching means formed of a pair of rollers.

FIG. 1

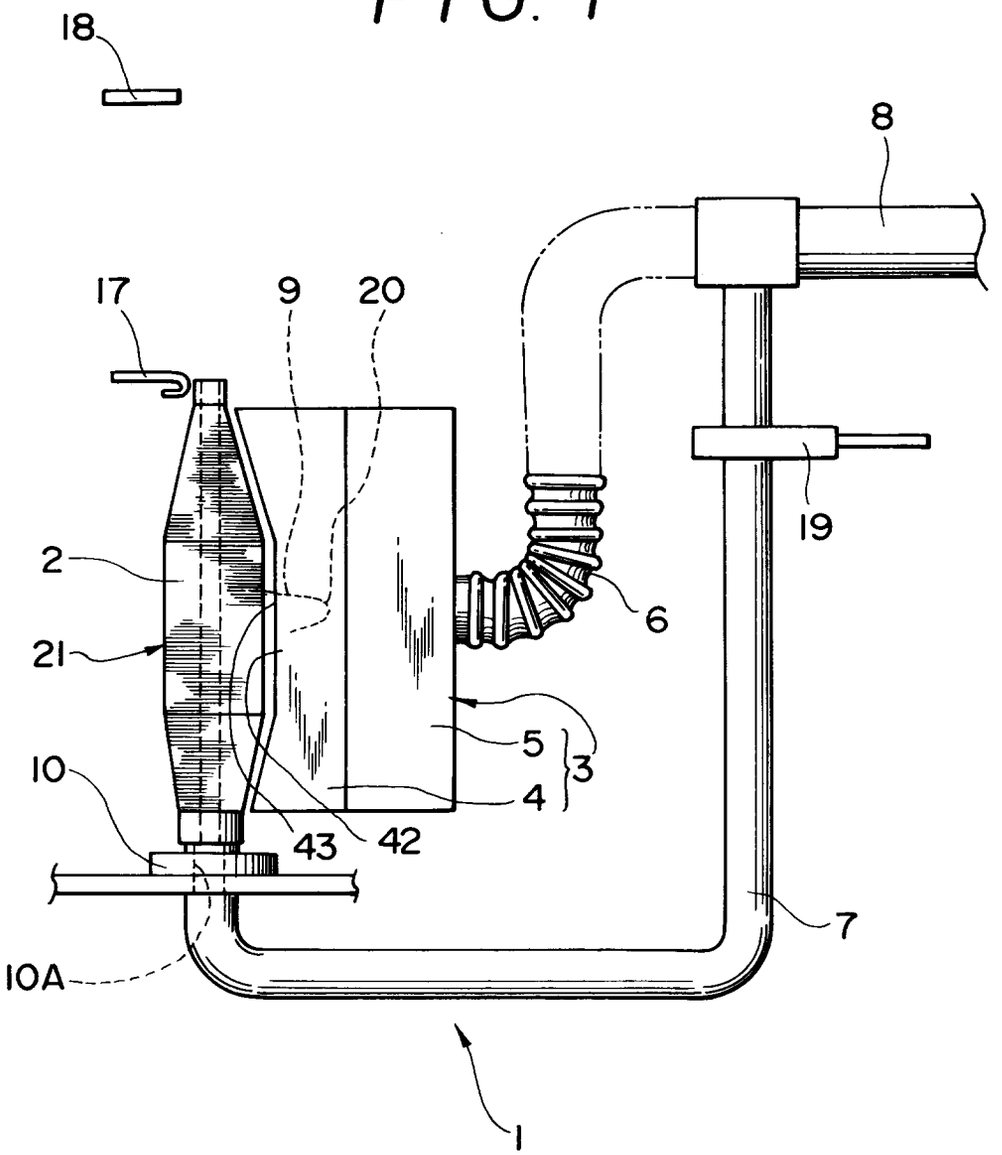


FIG. 2

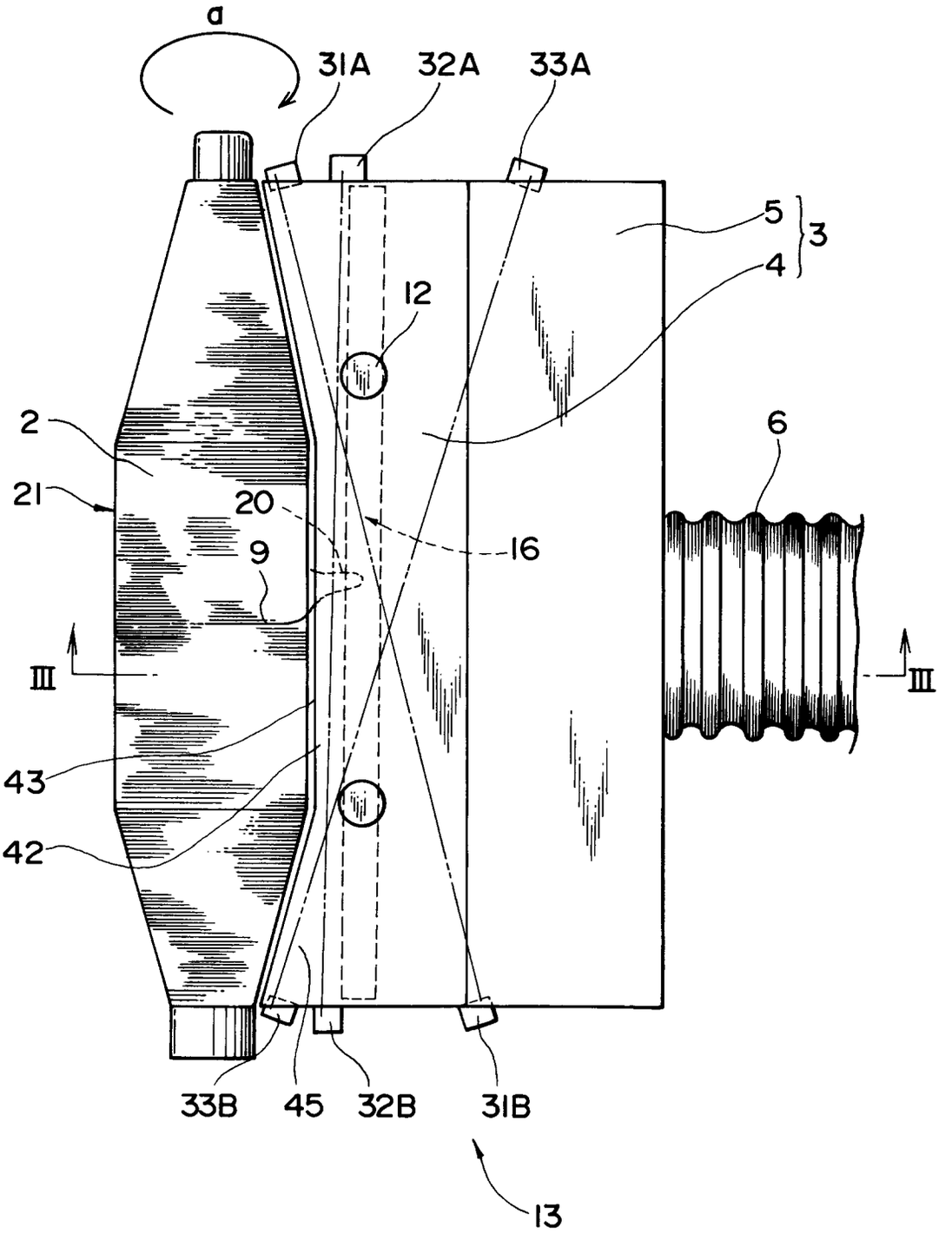


FIG. 3

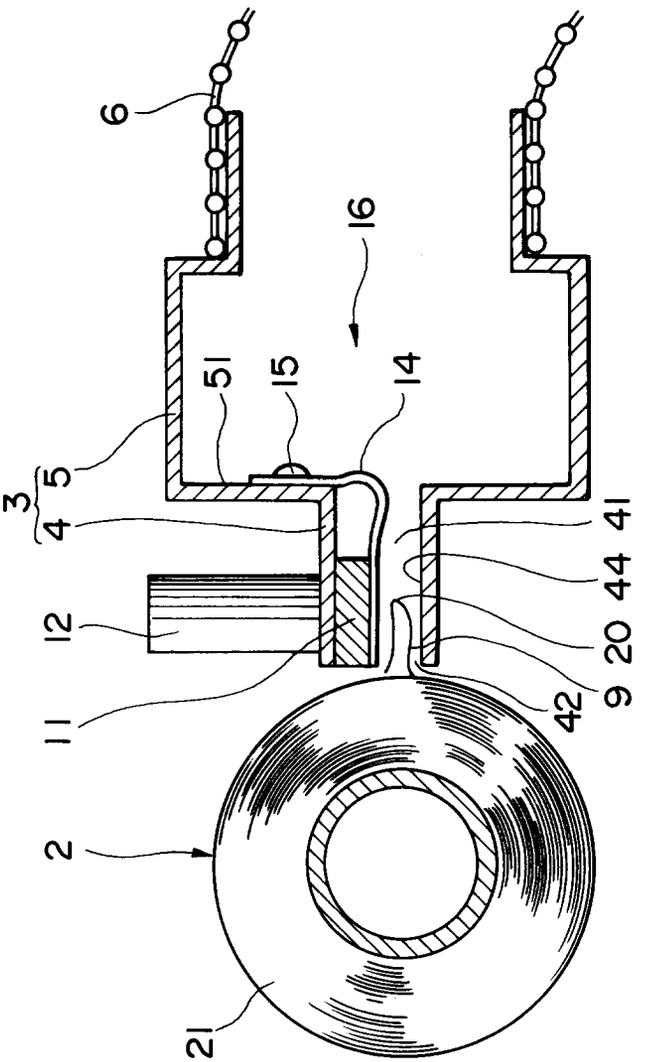


FIG. 4

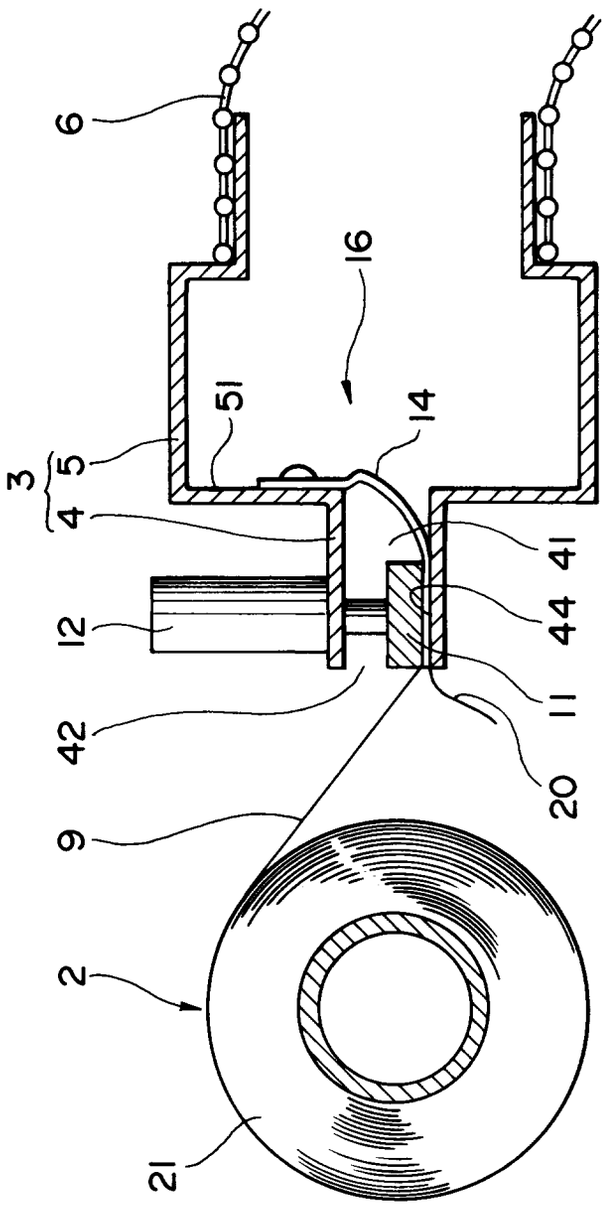


FIG. 5

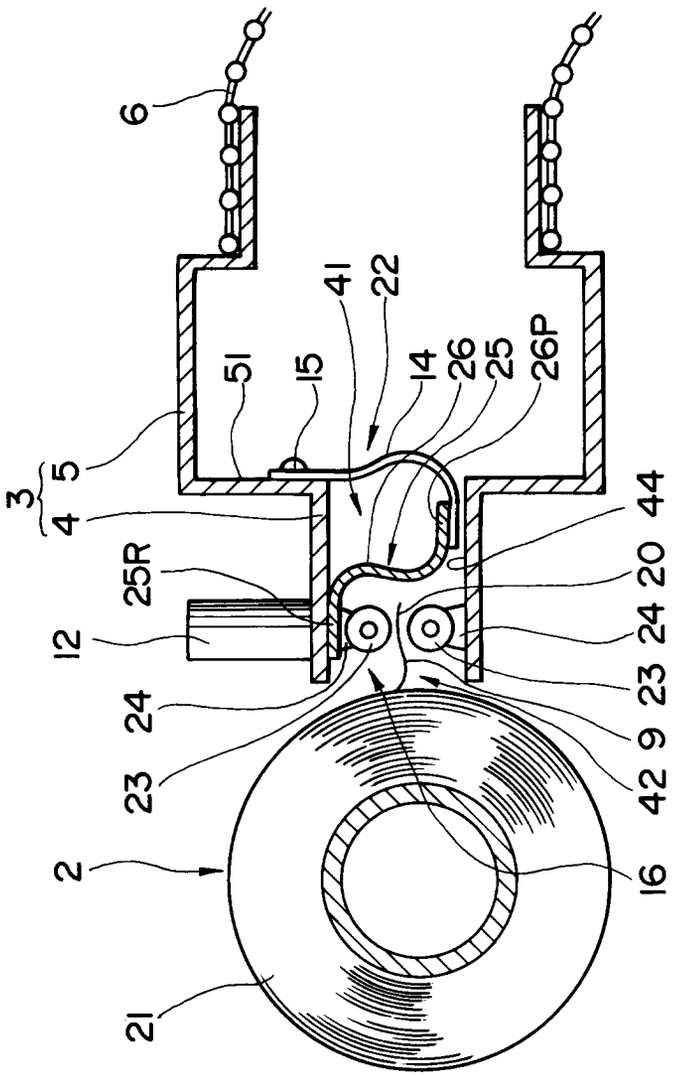


FIG. 6

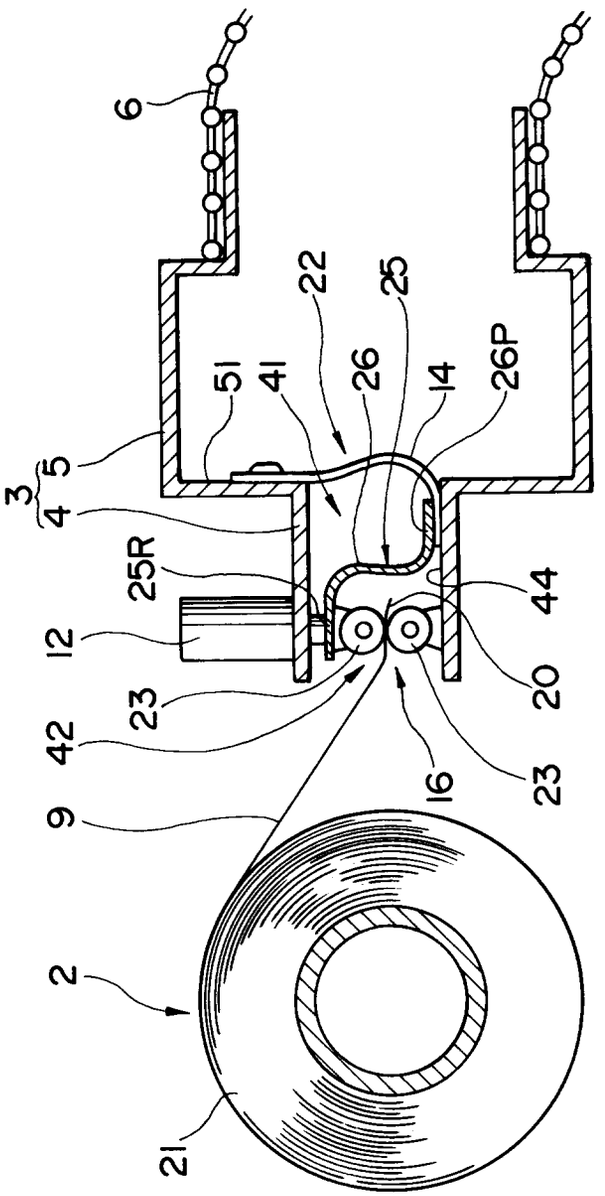
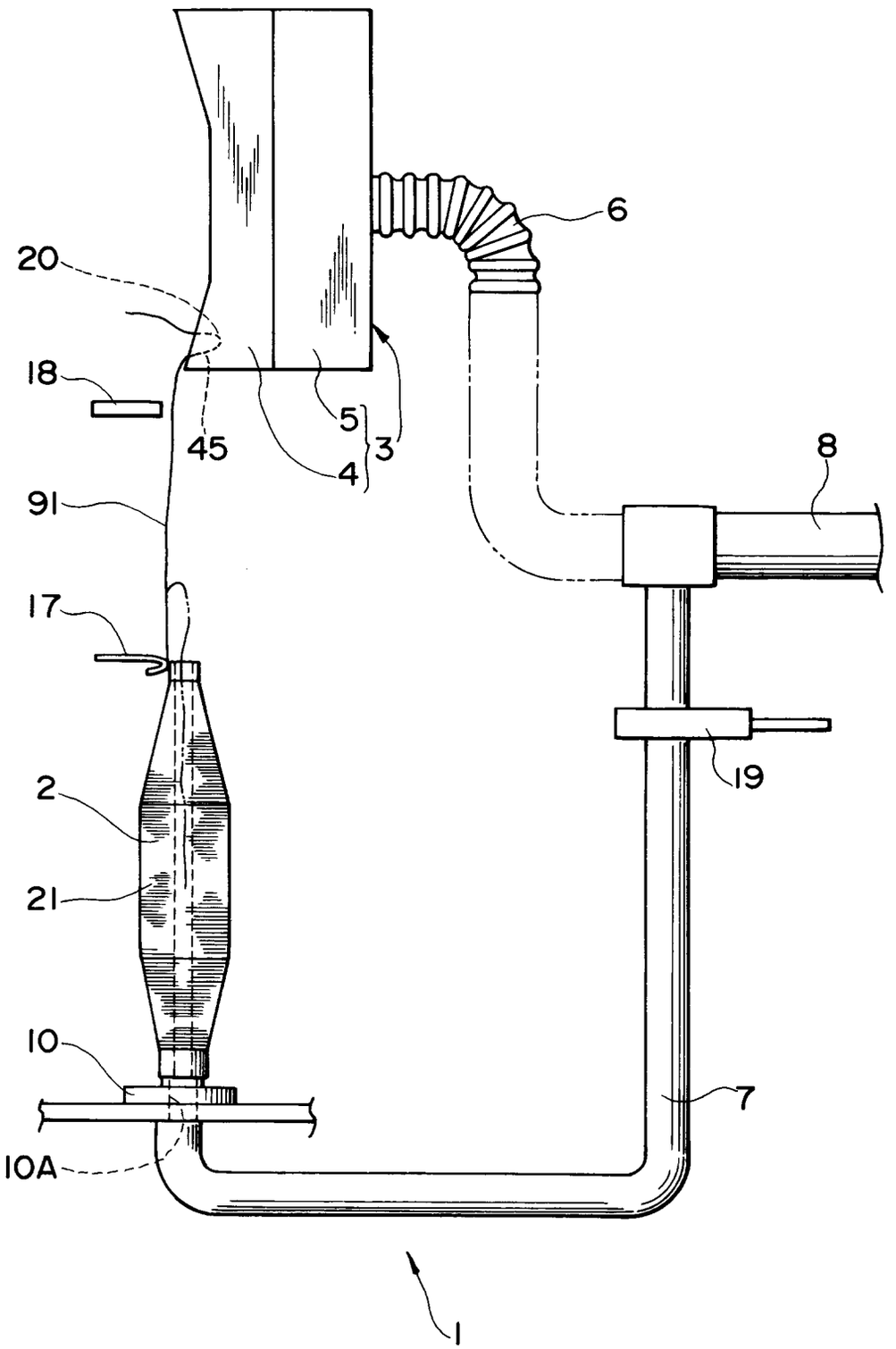


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 92 12 0105

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)
Y	GB-A-2 048 970 (SCHWEITER ENGINEERING) * page 2, line 50 - page 3, line 27; figures 1-4 *	1,2	B65H67/08
P,Y	EP-A-0 482 475 (MASCHINENFABRIK REITER AG) * page 4, column 6, line 14 - page 6, column 10, line 9; figures 3-7 *	1,2	
A	CH-A-334 274 (WILHELM KÜPPER) 15 January 1959 * page 2, line 65 - line 71; figures 1-10 *	1,2	
A	CH-A-435 074 (HANS RAASCH) * the whole document *	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08 JULY 1993	HENNINGSEN O.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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