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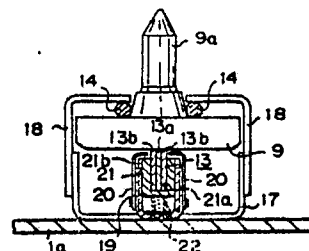
(54) **Apparatus for displacing a row of peg-trays in a textile mill.**

EP 0 314 089 A1

(57) An apparatus for transporting a row of peg-trays (9) in a textile mill, comprising a linear guiding element (14) arranged along a transportation path (15) of the peg-tray (9), for guiding the peg-tray (9) while in contact with the upper surface of the peg-tray (9), conveyor belt (13) arranged in parallel to the guiding element (14) so that the peg-tray (9) is sandwiched between the guiding element (14) and the conveyor belt (13), and means (19, 21, 22; 40; 42, 44; 50; 60, 64) for supporting the conveyor belt (13) in contact with the lower surface of the peg-tray

(9). A coefficient of kinetic friction between the lower surface of the peg-tray (9) and the conveyor belt (13) being larger than that between the supporting means (21, 42, 50, 60) and the conveyor belt (13).

Fig. 3(b)



APPARATUS FOR DISPLACING A ROW OF PEG-TRAYS IN A TEXTILE MILL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a transportation of bobbins in a textile mill, particularly between a spinning process and a winding process, while each the bobbin is mounted on a peg-tray.

2. Description of the Related Arts

As described in Japanese Unexamined Patent Publication No. 60-5247, a transportation system utilizing a peg-tray is preferable to the conventional conveyor system when full bobbins produced in a spinning process are transported to a winding process and empty bobbins discharged from the winding process are returned to the spinning process through a conveying means directly connecting both processes. An apparatus for displacing the peg-tray is disclosed, for example, in Japanese Unexamined Utility Model Publication No. 61-202471 and Japanese Unexamined Patent Publication No. 62-27278, in which a peg-tray is inserted into a gap between a pair of guide rails, each confronting the other and having a C-shaped cross-section, and conveyed by a conveyor belt while the lower surface of the peg-tray is in contact therewith.

When the peg-tray is laid on the conveyor belt under its own gravity, however, it is difficult to displace the same along a steeply rising slope, whereby the transportation path must be prolonged in comparison with a case in which a steep slope is adopted. To solve this drawback, the peg-tray may be biased to the guide rails by the resiliency of the conveyor belt so that the peg-tray is always supported by the guide rails. This, however, results in an increase of a frictional resistance between a belt guide and the conveyor belt, which in turn causes rapid wear of the conveyor belt and the guide thereof and the biasing effect of the conveyor belt is lost in a shorter period.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide an apparatus for transporting a peg-tray along a path having a desired configuration.

Another object of the present invention is to provide an apparatus for transporting a peg-tray,

which is suitably built-in in a compact doffer for a spinning frame.

These objects are achieved by an apparatus for transporting a row of peg-trays in a textile mill, comprising a linear guiding element arranged along a transportation path of the peg-tray, for guiding the peg-tray while in contact with the upper surface of the peg-tray, a conveyor belt arranged in parallel to the guiding element while the peg-tray is sandwiched between the guiding element and the conveyor belt, and means for supporting the conveyor belt to be in contact with the lower surface of the peg-tray. The apparatus is characterized, according to the present invention, in that a coefficient of kinetic friction between the lower surface of the peg-tray and the conveyor belt is larger than that between the supporting means and the conveyor belt.

The conveyor belt preferably comprises an uppermost portion having a lower coefficient of kinetic friction and in contact with the supporting means, and a lowermost portion having a higher coefficient of kinetic friction and in contact with the peg-tray.

The supporting means preferably comprises a roller in rolling contact with the conveyor belt.

In an alternative embodiment, the supporting means may comprise a guide block having a recess in the cross-section thereof suitable for receiving the conveyor belt, and resiliently supported from a stationary frame to bias the conveyor belt toward the peg-tray.

In a further embodiment, the supporting means may comprise a blade spring for directly and resiliently supporting the conveyor belt to bias the latter toward the peg-tray.

BRIEF DESCRIPTION OF THE DRAWINGS

The further advantages and features of the present invention will be more apparent from the following description with reference to the drawings illustrating the preferred embodiments according to the present invention: wherein;

Fig. 1 is a perspective view illustrating a relationship between a doffer and a spinning frame, in which an apparatus according to the present invention is incorporated;

Fig. 2 is a back cross-sectional view of the doffer shown in Fig. 1;

Fig. 3(a) is a diagrammatic side sectional view of an apparatus for transporting a peg-tray according to the present invention;

Fig. 3(b) is a section taken along the line A-A of Fig. 3(a);

Fig. 4(a) is a view similar to Fig. 3(a), illustrating another embodiment of the present invention;

Fig. 4(b) is a section taken along the line B-B of Fig. 4(a);

Fig. 5(a) is a view similar to Fig. 3(a) and 4(a), illustrating a further embodiment of the present invention;

Fig. 5(b) is a section taken along the line C-C of Fig. 5(a);

Fig. 6(a) is a view similar to Figs. 3(a), 4(a) and 5(a), illustrating a still further embodiment of the present invention;

Figs. 6(b) through 6(d) are possible sections, respectively, taken along the line D-D of Fig. 6(a);

Fig. 7 and 8 are views similar to Fig. 3(b), respectively, illustrating other embodiments of the present invention; and

Fig. 9 is a diagrammatic side view illustrating an application of the present invention to a bobbin transportation between a spinning process and a winding process.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figs. 1 and 2, an auto-doffer 1 is provided so as to be movable along a ring spinning frame by a driving torque generated by a motor 4, which is transmitted to the doffer 1 through a screw roller 5 engaged with a series of pins 3 secured at a distance on a rail 2. A conveyor belt 7 extends beneath a spindle rail 6 in parallel thereto and is adapted to carry thereon a peg-tray 9 having a diameter substantially equal to an arrangement pitch of a spindle 8 of the spinning frame. A plurality of peg-trays 9A, each carrying an empty bobbin, are arranged on the conveyor 7 so that each bobbin corresponds to a spindle 8.

As shown in Fig. 1, in a front region of the lower part of the doffer 1, as seen in the running direction of the doffer 1, an entry plate 10 is provided for taking the peg-tray 9A with an empty bobbin into the interior of the doffer 1. Also an exit plate 11 is provided in a rear region for transferring a peg-tray 9B with a full bobbin from the doffer 1 to the conveyor belt 7. According to this mechanism, as the doffer 1 moves forward, the peg-trays 9A with empty bobbins are taken one by one into the interior of the doffer 1, while the peg-trays 9B with full bobbins are transferred one by one onto the conveyor belt 7.

In the side region of the interior of the doffer 1 nearer to a spinning frame is provided a distorted transportation path consisting of a flat belt 13 driven by a motor 12, and a pair of linear guiding

elements 14. This distorted transportation path moves the peg-tray 9A with an empty bobbin taken into the doffer 1 through the entry plate 10 upward to bring the same to a position corresponding to but above a full bobbin F mounted on the spindle 8. The empty bobbin E is unloaded from the peg-tray 9A in this position. The transportation path then moves the peg-tray 9 thus unloaded downward to bring the same to a position corresponding to the lower portion of the spindle 8. The peg-tray 9 is loaded with the full bobbin F doffed from the spindle 8 in this position. The transportation path moves the peg-tray 9B thus loaded downward to bring the same to the vicinity of the exit plate 11. A conveyor belt 13 of the distorted transportation path 15 is guided by a plurality of pulleys 16 to have three horizontal areas; a first areas running in parallel to the conveyor belt 7 at a height corresponding to that of the latter, a second area running in parallel to the spindle rail 6 at a height corresponding to that of the lower portion of the spindle, and a third area running in parallel to the spindle rail 6 at a height above the full bobbin F mounted on the spindle 8. It should be noted that the conveyor belt 13 runs in the first area in the running direction of the doffer 1.

As shown in Figs. 3(a) and 3(b), a plurality of brackets 17, each having a U-shape cross-section, are fixedly secured on a rear inner wall 1a of the doffer 1 at a distance therebetween along the peg-tray transportation path. A pair of support members 18 are secured to the free ends of each bracket and opposing each other. Each support member 18 fixedly supports, at the free end of the inner wall thereof, a continuous linear guide member 14 extending lengthwise along the transportation path. Similarly, in each area between the respective adjacent brackets 17, one or more guide brackets 19; each having a U-shaped cross-section are fixedly secured on the rear inner wall 1a of the doffer 1 along the transportation path. A pair of L-shaped stops 20 are secured to the free ends of each the guide brackets 19, and opposing each other. In a central space of the guide bracket 19 is fitted a guide block 21 having a U-shaped cross-section, so that it is slidably movable up and down but cannot be displaced lengthwise of the transportation path due to the engagement of a projection 21b of the guide block 21 with a slot 19b formed on the inner wall of the guide bracket 19. The conveyor belt 13 is slidably guided by the guide block 21 while passing through a central groove 21a thereof, while the guide block 21 is retained within the guide bracket 19.

A pair of coil springs 22 are intervened between the rear inner wall 1a of the doffer 1 and the guide block 21 at the opposite end region thereof to bias the latter toward the linear guiding elements

14. The peg-tray 9 is inserted into a gap between the guiding element 14 and the conveyor belt 13 with a peg 9a thereof fitted between the pair of guiding elements 14. Thus, the conveyor belt 13 is pressed onto the lower surface of the peg-tray 9 due to the action of the spring 22, and the upper surface of the peg-tray 9 is pressed onto the guiding elements 14. In this regard, the stop 20 serves to prevent the guide block 21 from escaping from the guide bracket 19 until the conveyor belt 13 is inserted in the central groove 21a and suppresses the upward movement of the guide block 21. Therefore, the stop 20 may be removed after the insertion of the conveyor belt 13 has been completed.

The conveyor belt 13 is formed by laminating a pair of outer layers 13a having a higher coefficient of kinetic friction with the intervention of a core layer 13b having a lower coefficient thereof in such a manner that the core layer 13b is staggered widthwise to both the outer layers 13a so that the conveyor belt 13 is brought into contact with the peg-tray 9 by only a free edge of the outer layers 13b on one hand, and with the bottom wall of the central groove 21a of the guide block 21 by only a free edge of the core layer 13b on the other hand.

In the interior of the doffer 1, a carriage 23 is secured to the rear inner wall 1a and is slidable in the running direction of the doffer 1, by shafts 24 and 25. The carriage 23 is provided with an empty bobbin donning device 26 which removes the empty bobbin E from the peg-tray 9A transported to the position above the full bobbin F mounted on the spindle 8 and dons the empty bobbin E onto the spindle 8 after the full bobbin F has been doffed. The carriage 23 is also provided with a full bobbin doffing device 27 which doffs the full bobbin F from the spindle 8 and inserts the same on the peg-tray 9 transported to the position at a level equal to the lower portion of the spindle 8. The carriage 23 is reciprocatedly movable along the shafts 24 and 25 by the pivotal motion of a cam lever 29 driven by a cam 28 operatively connected to the screw roller 5. A pair of arms 31 of an empty bobbin gripper 30 constituting the empty bobbin donning device 26 are also driven by the screw roller 5 through a shaft 35 and a cam/gear mechanism (not shown). Similarly, a pair of arms 33 of a full bobbin gripper 32 constituting the full bobbin doffing device 27 are driven by the screw roller 5 through a shaft 36 and a cam/gear mechanism (not shown). When the carriage 23 is moved in the direction opposite to the running direction of the doffer 1, the speed of the carriage 23 relative to the spindle 8 on the spinning frame becomes zero. In this period, the empty bobbin donning device 26 and the full bobbin doffing device 27 are driven to doff the full bobbin F from the spindle 8 and don the empty

bobbin E onto the spindle 8. A plate 37 is provided in the doffer 1 for supporting a tip of the empty bobbin E mounted on the peg-tray 9A, which bobbin is to be held by the gripper 30, and thus will not fall off of the peg 9a of the peg-tray 9A. Also a positioning member 38 driven by a rotary solenoid 39 to interfere with the transportation path is provided for positioning the peg-tray in place when the donning operation is carried out.

When the spinning frame is made to stop in accordance with a signal issued upon completion of the full bobbin, the doffer 1 waiting at one end of the spinning frame starts to run at a predetermined constant speed. Simultaneously therewith, the motor 21 for the distorted transportation device 15 is energized to drive the conveyor belt 13 in the arrowed direction as shown in Figs. 1 and 2. Under such conditions, the pegtrays 9A with empty bobbins E are taken one by one from the conveyor belt 7 into the doffer 1 by the action of the entry plate 10. The peg-tray 9A thus taken-in is then introduced into the distorted transportation path in the vicinity of the entry plate 10 with the peg 9a thereof intervening between a pair of linear guiding elements 14, whereby the peg-tray 9A in the upright position is gradually tilted to the horizontal position as it advances, in accordance with the distortion of the path. The lower surface of the peg-tray 9A is resiliently pressed onto the free edges of the outer layers 13b by the action of the spring 22 through the guide block 21. The reaction from the conveyor belt 13 causes the peg-tray 9A to press against the guiding elements 14, and thus the peg-tray 9A can be conveyed upward by the conveyor belt 13 while in the horizontal position, with the assistance of the guiding elements 14.

The lower surface of the peg-tray 9A is in contact only with the free edges of the outer layers 13b during the transportation and the bottom surface of the central groove 21a of the guide block 21 is in contact only with the free edge of the core layer 13a. According to this contact mechanism, a pressure applied by the spring 22 to the guide block 21 is transmitted to the conveyor belt 13 through the contact area between the edge of the core layer 13a and the bottom of the central groove 21a. This pressure is also transmitted to the peg-tray 9A through the contact area between the lower surface of the peg-tray 9A and the edges of the outer layers 13b, so that the upper surface of the peg-tray 9A is pressed onto the guiding elements 14. Therefore, even if the coil spring 22 is adopted, having a high elastic modulus sufficient to generate a necessary frictional resistance between the lower surface of the peg-tray 9A and the conveyor belt 13, a frictional resistance between the contact area of the guide block 22 and that of the core layer 13a can be kept at a low level, which areas serve to

transmit the biasing force of the spring 22 to the conveyor belt 13. Due to this frictional relationship, the conveyor belt 13 is movable at a high speed, while smoothly guided by the guide block 2, and the peg-tray 9A can be displaced without slippage to the conveyor belt 13. In addition, wear between the guide block 21 and the conveyor belt 13 is greatly decreased.

When the peg-tray 9A with empty bobbin has been conveyed to the upper area of the doffer 1, it is disposed in a predetermined position by the action of the positioning member 38. Then the empty bobbin E is removed from the peg-tray 9A by the empty bobbin donning device 26 and held thereby. While the carriage 23 is moving opposite to the running direction of the doffer 1 the full bobbin F on the spindle 8 is doffed and held by the full bobbin doffing device 27, and the empty bobbin E held by the empty donning device 26 is donned onto the aforesaid spindle 8. During these operations, the peg-tray 9 from which the empty bobbin E has been removed is displaced to a waiting position on the transportation path at a level corresponding to the spindle rail 6. This waiting position is correctly defined by the action of the positioning member 45. Then the full bobbin F which has been held by the full bobbin doffing device 27 is transferred to the waiting peg-tray 9. The peg-tray 9B thus loaded with the full bobbin F is displaced to the exit plate 11 along the transportation path with the cooperation of the conveyor belt 13 and the guiding elements 14, at which the position of the full bobbin F is made to change from the horizontal to the vertical due to the distortion of the transportation path, and transferred on the conveyor belt 7.

In the above structure, since an optimum relationship is set between the frictional resistance between the guide block 21 and the conveyor belt 13, and between the conveyor belt 13 and the peg-tray 9 due to the laminated structure of the conveyor belt 13, the peg-tray 9 is smoothly conveyed on the transportation path even in the horizontal or vertical positions, while pressed onto the guiding elements 14 without wear of the peg-tray or the member constituting the path, especially the guide block 21.

The present invention is not limited to the above embodiment but includes variations illustrated in Figs. 4 through 8.

According to the embodiment shown in Figs. 4(a) and 4(b), a blade spring 40 having a U-shaped cross-section is used instead of the coil spring 22 in the above embodiment. Also a pin 41, instead of the stop 20, is loosely fitted through a vertical slot 19a onto the respective side of the guide block 21 accommodated in the guide bracket 19.

In Figs. 5(a) and 5(b), the conveyor belt 13 is

formed of a lower layer 13c having a lower coefficient of kinetic friction and solely in contact with the guide block 42 and an upper layer 13d having a higher coefficient of kinetic friction and solely in contact with the peg-tray 9. In addition, the guide block 42 is pivoted at one end thereof to a stationary wall by a pin 43 and is biased upward in the drawings at the other end thereof by a coil spring 44 engaged with a projection 42a protruded from the respective side of the guide block 42.

Another embodiment is illustrated in Figs. 6(a) and (b). In this embodiment, the guide block 21 or 42 is eliminated and the coil spring 22 in Fig. 3 is replaced by a blade spring 50 provided beneath the conveyor belt 13. A plurality of the blade springs 50 are arranged at a distance from each other and directly in contact, through a low frictional ceramics coating applied thereon, with the lower surface of the conveyor belt 13 within the guide bracket 19. As shown in Fig. 6(b), the conveyor belt 13 is formed of outer layers 13b having a high coefficient of kinetic friction, such as rubber, and in contact with the peg-tray 9 and a core layer 13a having a low coefficient of kinetic friction, such as nylon, and in contact with the blade spring 50 sandwiched between the former. The peg-tray 9 is pushed upward in the drawing by the conveyor belt 13 and the upper surface of the peg-tray 9 is forcibly brought into contact with the guiding elements 14 fixed to the support members 18.

Figure 6(c) is a variation of the embodiment shown in Fig. 6(b), in which the support member 18 is connected with the bracket 17 by a set screw 51 and a vertical slot 52 so that the height of the guiding element 14 can be adjusted by changing the set position of the screw 51.

Figure 6(d) is a further variation of Fig. 6(b), in which the guide bracket 19 and the support member 18 are integral with each other.

Figure 7 is a still further embodiment, according to the present invention, in which the support member 18 is connected with the bracket 17 by a blade spring 53 which is biased to bend in the arrowed direction so that the guiding element 14 is forced into resilient contact with the peg-tray 9. In this embodiment, the conveyor belt 13 is formed by a core layer 13a having a lower coefficient of friction and outer layers 13b having a high coefficient of friction.

Figure 8 is an alternative embodiment in which the conveyor belt 13 made of a single material having a high frictional coefficient such as rubber is biased toward the peg-tray 9 by a guide roller 60 having a groove 65 on the periphery thereof to engage with the conveyor belt 13. A shaft 61 thereof is rotatably supported by a pair of brackets 62. Each of the brackets 62 has an aperture 63 in which a spring 64 is accommodated for biasing the

shaft 61 upwards through a vertical slot 66 in the bracket 62 so that the conveyor belt 13 running while engaged with the groove 65 is pressed onto the lower surface of the peg-tray 9.

According to all the embodiments described above, a conveyor belt is simultaneously in contact on one hand with means for guiding the conveyor belt, such as a guide block 22, 42 or a guide roller 60, and on the other hand with a peg-tray. Since coefficients of kinetic friction in both contact areas are suitably adjusted by the structure according to the present invention, the posture of a peg-tray during the transportation thereof is optionally selectable, i.e., horizontal or slanted, without undesirable wear. For example, according to the present invention, a steep transportation path 70 as shown in Fig. 9 may be realized without difficulty, for providing a walk way 73 for an operator, which path is used for conveying the peg-tray 9 between a spinning frame 71 and a winder 72.

the conveyor belt to bias the belt toward the peg-tray.

Claims

1. An apparatus for transporting a row of peg-trays in a textile mill, comprising a linear guiding element arranged along a transportation path of the peg-tray, for guiding the peg-tray while in contact with the upper surface of the peg-tray, a conveyor belt arranged in parallel to the guiding element while the peg-tray is sandwiched between the guiding element and the conveyor belt, and means for supporting the conveyor belt in contact with the lower surface of the peg-tray, characterized in that a coefficient of kinetic friction between the lower surface of the peg-tray and the conveyor belt is larger than that between the supporting means and the conveyor belt.

2. An apparatus as defined in claim 1, characterized in that the conveyor belt comprises an uppermost portion having a lower coefficient of kinetic friction and in contact with the supporting means, and a lowermost portion having a higher coefficient of kinetic friction and in contact with the peg-tray.

3. An apparatus as defined in claim 1, characterized in that the supporting means comprises a roller in rolling contact with the conveyor belt.

4. An apparatus as defined in claim 1, characterized in that the supporting means comprises a guide block having a recess in the cross-section thereof suitable for receiving the conveyor belt, and resiliently supported by a stationary frame to bias the conveyor belt toward the peg-tray.

5. An apparatus as defined in claim 1, characterized in that the supporting means comprises a blade spring for directly and resiliently supporting

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Fig. 2

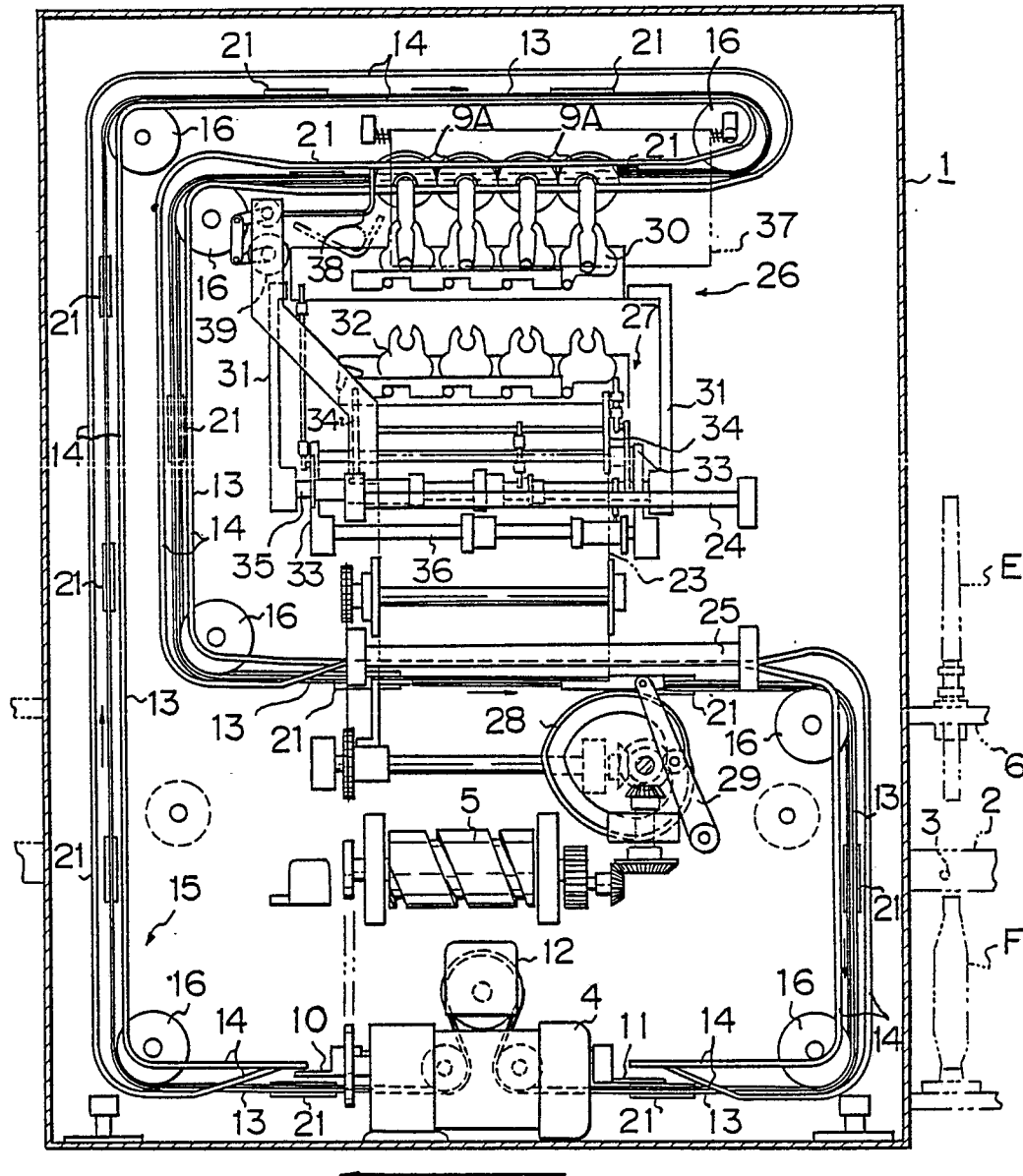


Fig. 3(a)

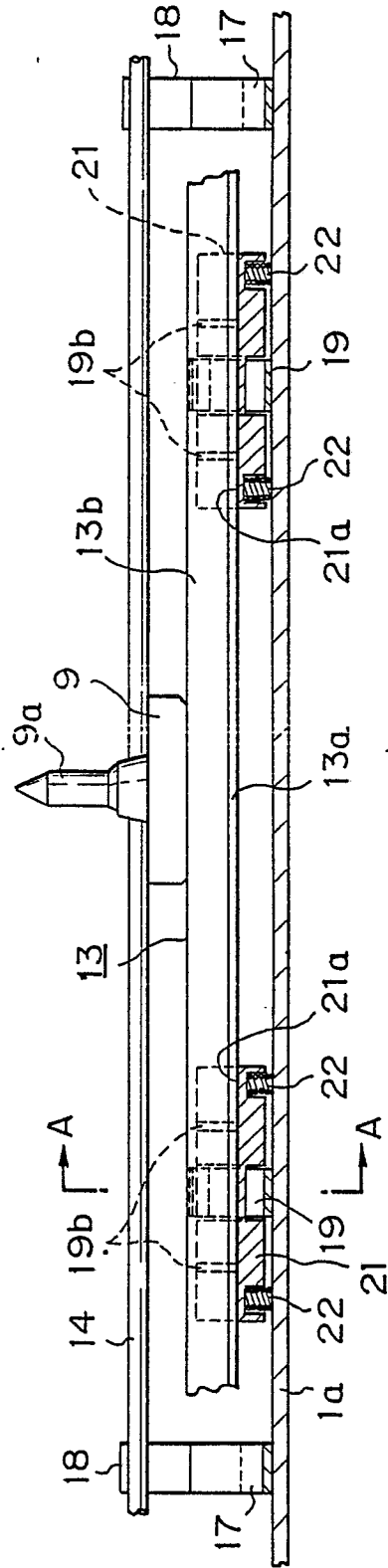


Fig. 3(b)

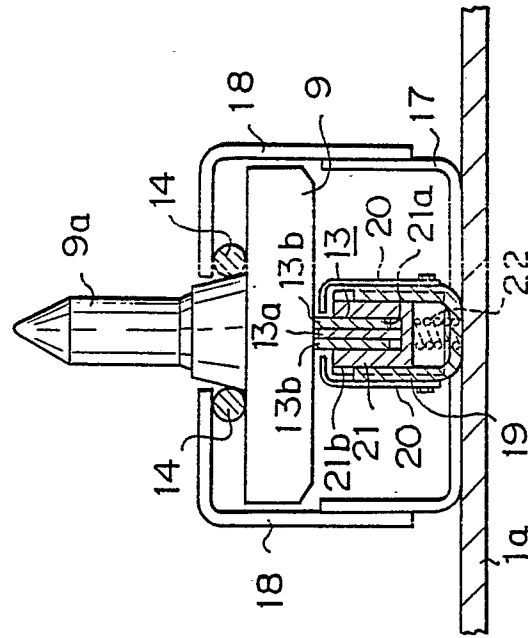


Fig. 4(a)

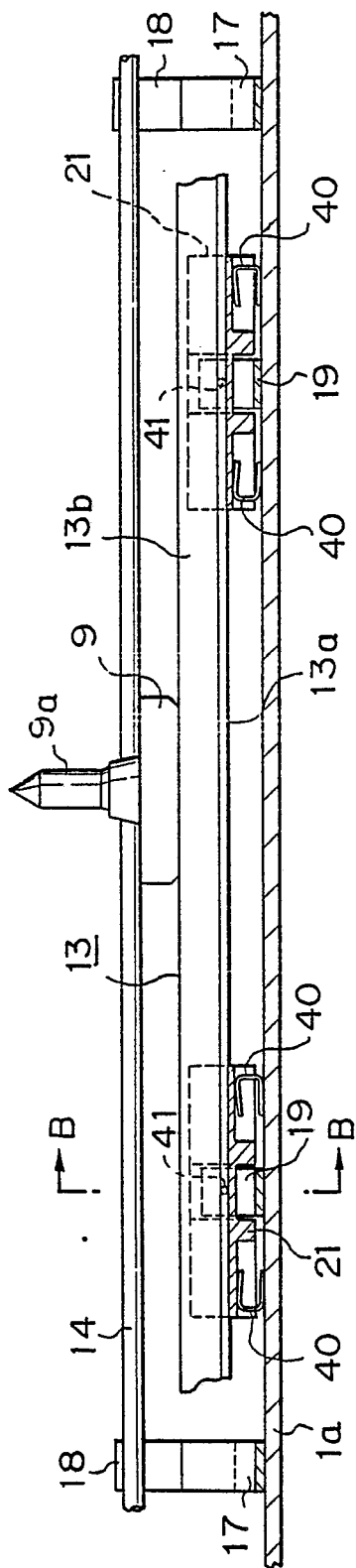


Fig. 4(b)

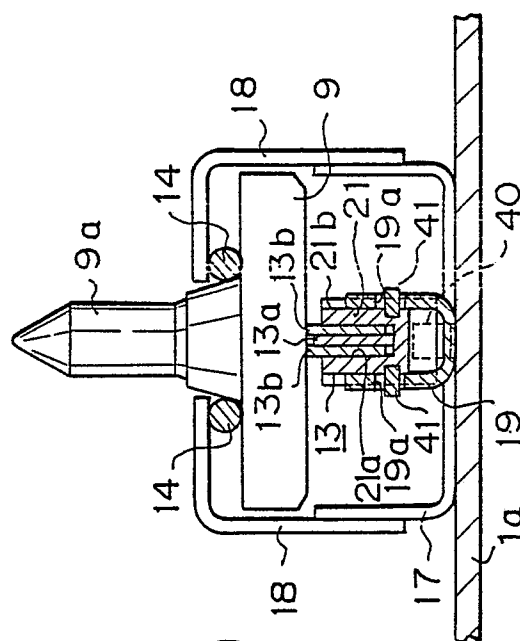


Fig. 5(a)

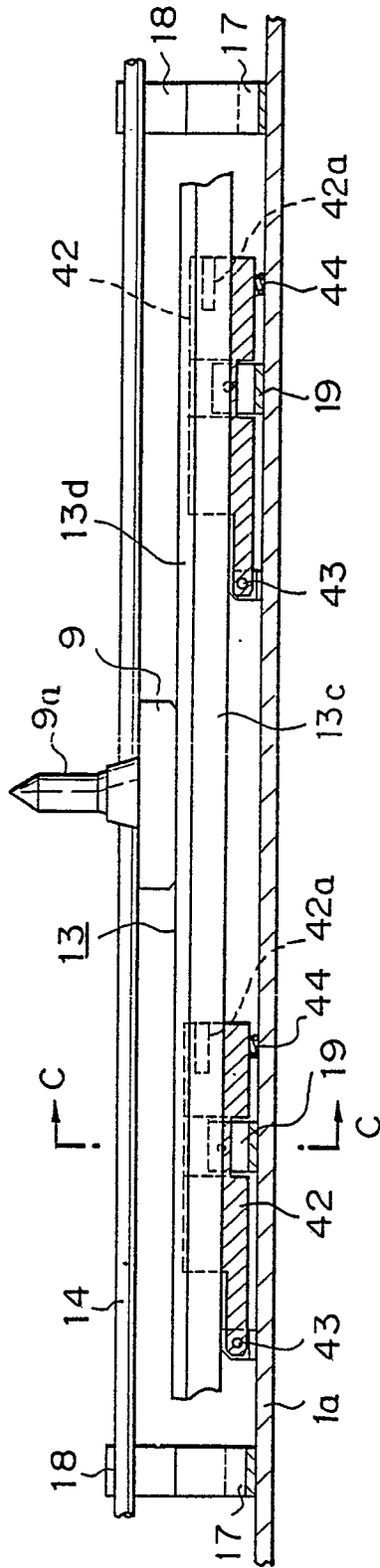


Fig. 5(b)

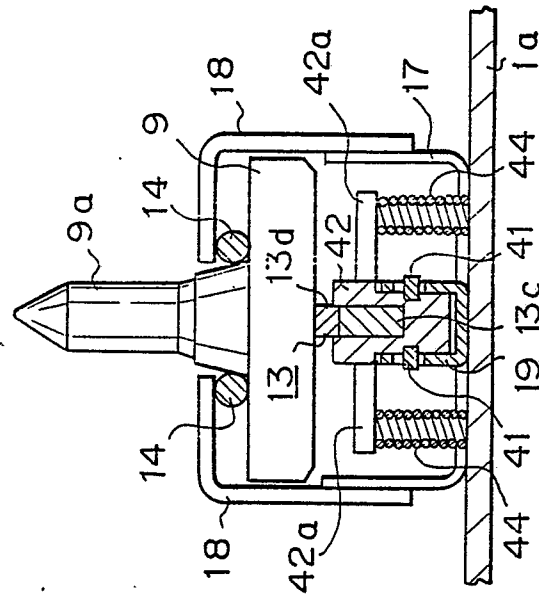


Fig. 6(a)

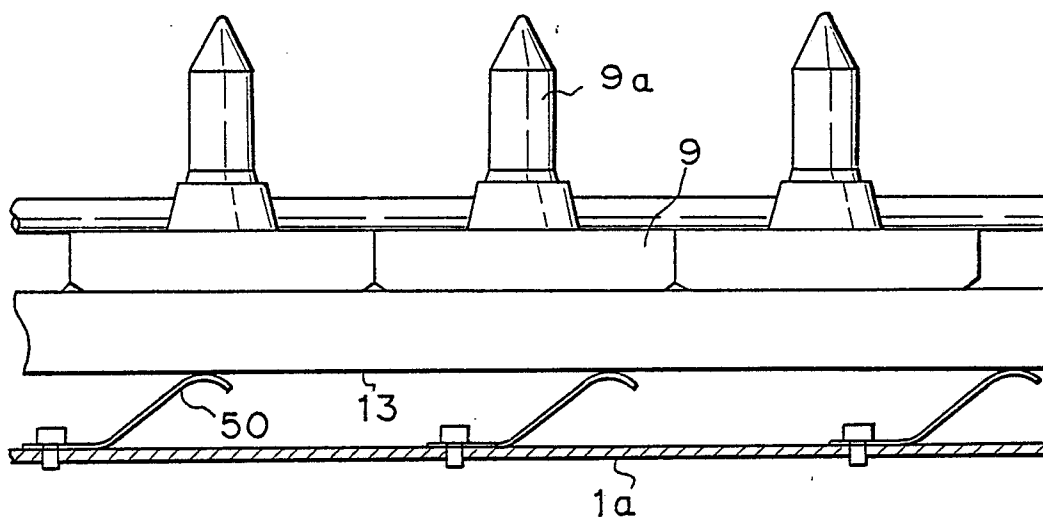


Fig. 6(b)

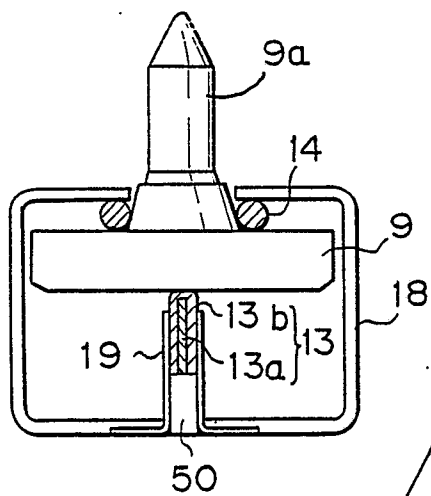


Fig. 6(c)

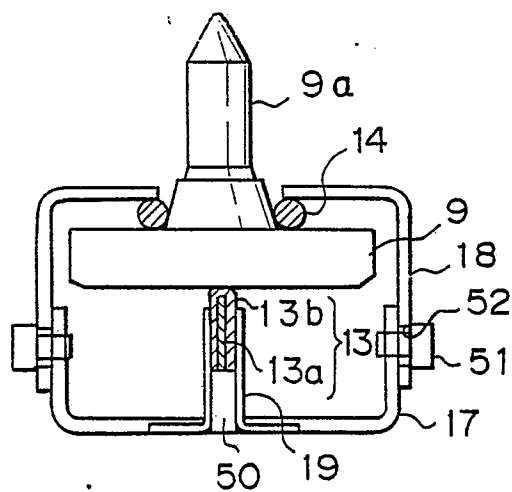


Fig. 6(d)

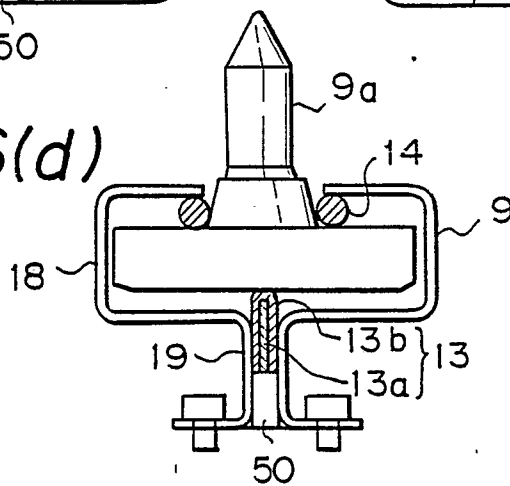


Fig. 7

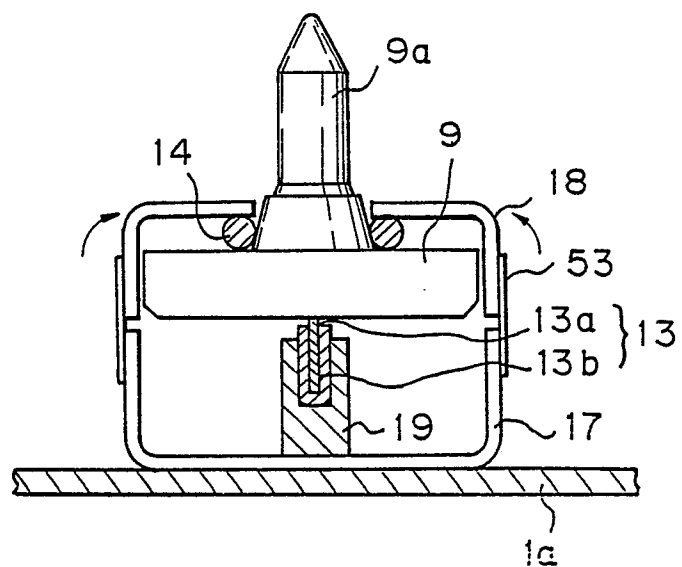


Fig. 8

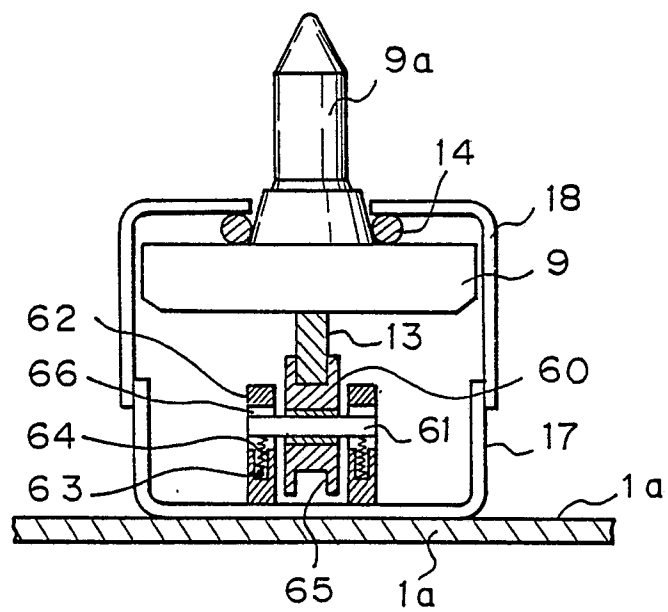
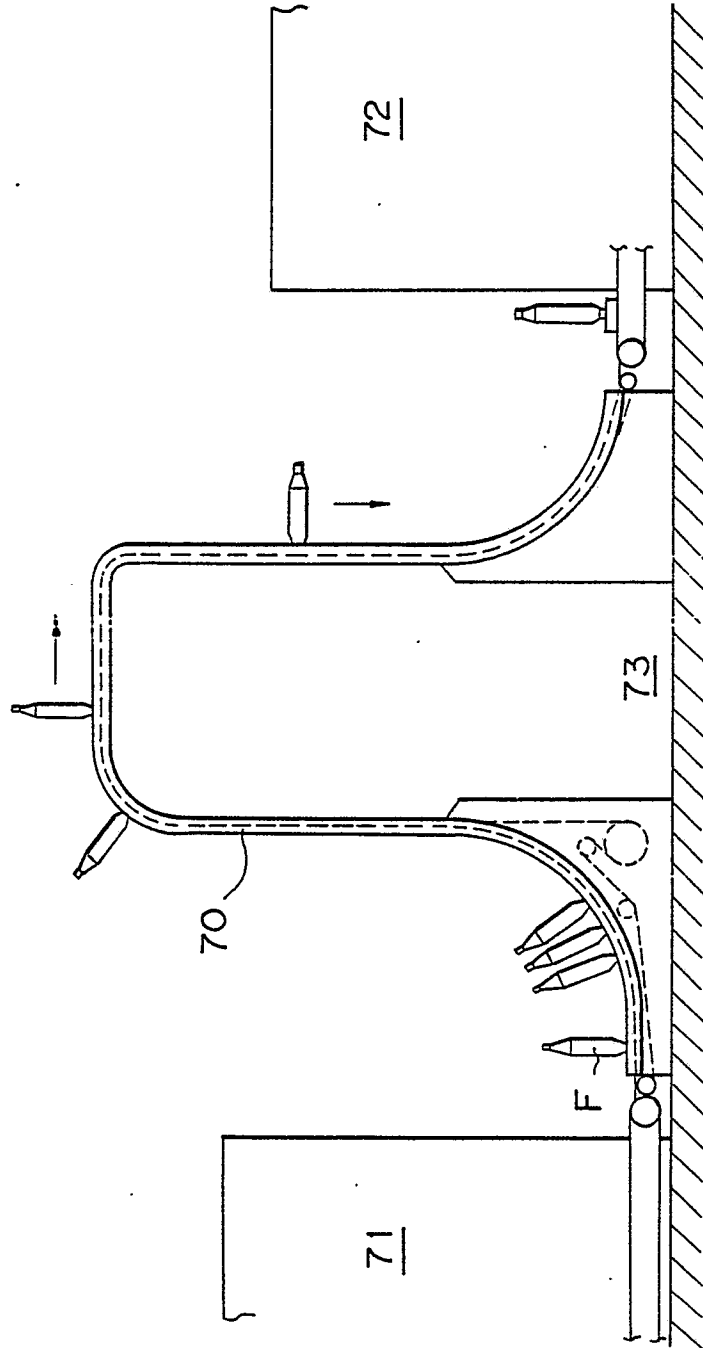


Fig. 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 11 7812

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.4)
X	DE-A-3630670 (MURATA KIKAI K.K.) * column 5, line 43 - column 6, line 57; claim 4; figures 3, 4 * -----	1,2,3	D01H9/18 D01H9/10 B65H67/06 B65G35/06
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D01H B65H B65G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 JANUARY 1989	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	