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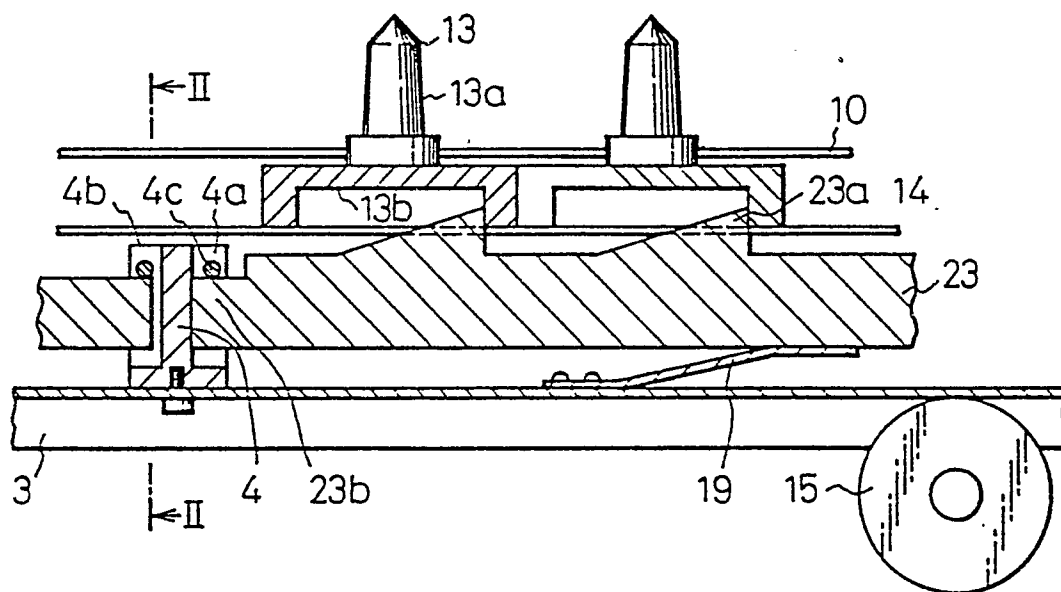
(54) APPARATUS FOR TRANSFERRING LOADED AND NON-LOADED BOBBINS FOR SPINNING MACHINES.

(57) An apparatus for transferring loaded and non-loaded bobbins for spinning machines, in which peg trays (13), each of which is provided on its upper surface with a bobbin inserting peg (13a) and on its lower surface with a locking recess (13b), are transferred in an arrayed state on a transfer path provided along the front side of a spindle array (7) of a spinning machine. A driving bar (3) adapted to be moved forward and backward intermittently in the bobbin transferring direction with a stroke larger than the pitch of the spindles of the spinning machine is provided along the bobbin transferring path. A tray positioning bar (23) on which a plurality of locking projections (23a) engageable with the locking recesses (13b) in the peg trays (13) are provided at regular intervals N (N being a natural number) times larger than the pitch of the spindles is formed linearly along the entire length of the driving bar (3). The tray positioning bar (23) is supported on the

driving bar (3) so that the positioning bar (23) can be moved vertically via a spring (19), and also forward and backward in accordance with the forward and backward movements of the driving bar (3). When the driving bar (3) is moved forward, the locking projections (23a) of the tray positioning bar (23) engage the opposed peg trays (13), so that the peg trays (13) are moved forward by a distance corresponding to the length of one peg tray. When the driving bar (3) is moved backward, the peg trays (13) are disengaged from locking projections (23a) by the action of the spring, so that the tray positioning bar (23) alone is moved back. This enables the peg trays to be positioned accurately irrespective of the dimensional errors and variations of the peg trays.

EP 0 371 134 A1

Fig.1



- 1 -

APPARATUS FOR TRANSPORTING FULL AND EMPTY BOBBINS
IN TEXTILE MACHINE

TECHNICAL FIELD

The present invention relates to an apparatus for transporting full and empty bobbins in a textile machine such as a ring spinning frame or a ring twisting frame.

5 BACKGROUND ART

To carry out a bobbin exchange operation for textile machine such as a ring spinning frame by an auto-doffer, preferably a bobbin transportation apparatus is provided for arranging empty bobbins in
10 front of the spinning frame and removing full bobbins doffed from spindles from an operative zone of the spinning frame.

In general, a conveyor system is used as the above type of transporting apparatus, in which a plurality of
15 pegs for mounting bobbins are secured on an endless belt at a pitch equal to that of a spindle of the spinning frame or half thereof. Such a conveyor system, however, has a drawback in that the conveyor belt is stretched and elongated by long term use, and thus the
20 predetermined pitch between adjacent pegs is adversely widened to cause problems in the operation of the auto-doffer.

To solve these problems, Japanese Unexamined Patent Publication No. 57-161133 discloses a bobbin
25 transporting apparatus, in which a guide rail is provided around a spinning frame. On the guide rail are mounted a series of peg-trays arranged in a toe-heel manner, each of which has a diameter equal to a spindle pitch and is provided with a peg on the upper side
30 thereof and an engagement recess on the lower side thereof. A driving device is arranged beneath the guide rail, and comprises a rod reciprocally displaceable in the lengthwise direction by a power cylinder and provided, at a pitch, with a plurality of hooks,

engageable with the recess of the peg-tray. In this driving device, when the peg-trays disposed on the guide rail in correspondence to the positions of the hooks are forwarded by a stroke of the rod, the remaining
5 peg-trays are also pushed forward thereby, whereby all of the peg-trays are stepwisely transported along the guide rail.

In the above bobbin transporting apparatus using peg-trays, a diameter of the peg-tray is made identical
10 to a spindle pitch of the spinning frame, so that each the peg-tray is conveyed along a row of the spindle while leading and trailing edges thereof are in contact with those of the adjacent peg-trays, and occupies a position corresponding to each of the spindles.

15 On the other hand, the spinning frame has at least about 200 spindles on one side thereof, and currently the number of spindles in one spinning frame is increasing. Accordingly, if a tolerance of a peg-tray is 0.1 mm (this value may be considered strict in
20 practice), a sum of the tolerances of 200 peg-trays amounts to 200 mm, which exceeds an allowable limit for the operation of an auto-doffer and causes serious problems in the bobbin exchange.

To avoid the problems caused by such an inevitable
25 dimensional error in the manufacture of the peg-trays, in the above conventional apparatus, each hook engageable with the recess of the peg-tray is arranged at a distance from the adjacent hook, so that each hook is assigned only to a group of peg-trays between the
30 particular peg-tray engaged with this hook and another peg-tray engaged with the preceding hook and driving the group of peg-trays. According to this structure, the manufacturing errors of the respective peg-trays are accumulated only within each group of peg-trays.

35 When the peg-trays are transported by pushing while being divided into groups, as sated above, the following equation should be satisfied:

$$\Delta A \geq \Delta D \times n$$

wherein ΔD is a tolerance of an outer diameter of the peg-tray; n is the number of the peg-trays in one group; and ΔA is a tolerance of a bobbin arrangement acceptable by an auto-doffer.

Taking the manufacturing cost of the peg-tray into account, it is preferable to use trays molded from plastics. The peg-tray thus obtained, however, has at best a tolerance ΔD of 0.2 mm, and the acceptable tolerance ΔA of the auto-doffer is usually around 2 mm. Therefore, from the above equation, $n \leq 10$ is obtained, and thus the number of peg-trays in one group should be at most 10. That is, in a spinning frame having 200 spindles on one side thereof, more than 20 hooks are needed to ensure a reliable bobbin exchange operation.

In addition, the ambient temperature under which the peg-tray is used is usually from 10°C to 40°C. For example, if the peg-tray having a diameter of 75 mm is made of polyacetal resin, a dimensional change caused by this temperature variation amounts to about 0.21 mm. Accordingly, the combined dimensional change in diameter of the peg-tray becomes 0.41 mm, whereby the number of the peg-trays in one group must be cut by half, compared to the number estimated by only the manufacturing tolerance of the peg-tray; which means that the number of the hooks must be doubled.

It will be apparent that any adjustment of such an increased number of engagement hooks requires much labor. Moreover, there is a greater probability that the hook will move out of position during repetitions of the operation. Further, the installation cost is higher.

The engagement hook is pivotably supported by a pin so that the hook occupies either an operative position in which the tip of the hook is engageable with the recess of the peg-tray, or a retracted position in which the hook allows the passage of the peg-tray thereover.

For this purpose, the bobbin transporting apparatus is provided, beneath the guide rail, with a plurality of pivots corresponding to the respective hooks. Since many flies are floating in a spinning mill where the apparatus is installed, it is natural that the more
5 pivots used, the greater the probability of an adverse effect on the pivots due to the flies. To avoid this problem, the frequency of cleaning and maintenance must be increased.

10 The object of the present invention is to solve these problems inherent to the prior arts.

DISCLOSURE OF THE INVENTION

The object of the present invention is achieved by an apparatus for transporting full and empty bobbins in
15 a spinning frame while mounting the respective bobbins on peg-trays arranged in series on a conveying path arranged in front of the spinning frame, each of the peg-trays having a peg on the upper side thereof and an engagement recess on the lower side thereof; wherein,
20 according to the present invention, a driving bar is provided along the conveying path and is displaceable in a lengthwise direction in a reciprocable manner at a stroke longer than a spindle pitch of the spinning frame, and a plurality of tray-positioning bars are
25 arranged in series on the driving bar throughout the length thereof, each of the tray-positioning bars having a plurality of projections engageable with the recess of the peg-tray at a pitch corresponding to N times the spindle pitch, wherein N represents a natural number;
30 the tray-positioning bar being held movably in the up-down direction on the driving bar through spring members, and movably in the lengthwise direction together with the reciprocation of the driving bar.

In the operation, the tray-positioning bar is
35 raised upward by the action of the spring members during the forward displacement of the driving bar, and each of the projection is engaged with the corresponding recess

of the peg-tray and displaces the same together with the driving bar. Accordingly, the respective peg-tray is displaced forward by a distance equal to the spindle pitch when the driving bar is in the foremost position. Then, upon a rearward displacement of the driving bar, the spring members supporting the tray-positioning bar are resiliently pushed down to allow the projection to pass under the peg-tray, and thus the peg-tray remains in the foremost position while the tray-positioning bar is returned to the original position together with the driving bar.

As stated above, according to the present invention, since the peg-tray is accurately positioned by the engagement projections arranged at a pitch which is N times the spindle pitch on the tray-positioning bar, any manufacturing errors in the respective peg-trays are accumulated within the sequentially arranged N peg-trays, and thus an accurate positioning of the peg-tray can be obtained, compared to the conventional system.

In general, one tray-positioning bar is assigned to one span of the spinning frame so that a correspondence of the peg-tray with the spindle can be performed simultaneously at each tray-positioning bar. This substantially eliminates the labor needed for adjustments of the position of the peg-tray.

In one embodiment of the present invention, the projections of the tray-positioning bars are preferably arranged at a pitch equal to the spindle pitch, so that a projection corresponds to a respective spindle. According to this construction, a system in which each adjacent peg-trays is arranged with a space therebetween can be adopted, instead of the above system in which the each adjacent peg-trays is arranged without a gap therebetween, in a toe-to-heel manner. In the former system, if a diameter of the peg-tray is smaller than a spindle pitch (75 mm), an accurate transportation of the

peg-tray can be achieved regardless of the manufacturing tolerance and dimensional changes due to temperature variation of the peg-tray. Moreover, the accumulation of files between adjacent peg-trays has no adverse effect on the positioning accuracy of the peg-tray.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be explained in more detail below with reference to the preferred embodiments illustrated in the attached drawings, in which:

Fig. 1 is an elevational cross-sectional view of an essential part of an apparatus according to one embodiment of the present invention;

Fig. 2 is a cross-sectional view taken along a line II-II in Fig. 1;

Fig. 3 is a frontal view of a spinning frame to which the present invention is applied;

Fig. 4 is an exploded perspective view of an essential part illustrated in Fig. 1;

Fig. 5 is a diagrammatic frontal view of part of a transporting apparatus shown in Fig. 1;

Fig. 6-(a) through 6 (d) are sectional views, respectively, illustrating the operation of the apparatus according to the present invention; and

Fig. 7 is an exploded perspective view of an essential part of another embodiment according to the present invention.

BEST MODE OF CARRYING OUT THE INVENTION

Figure 3 illustrates a spinning frame to which the present invention is applied.

A plurality of spindles 7 and intermediate pegs 8 are arranged in upper and lower rows, respectively, on a spindle rail 9 extending in the lengthwise direction of the frame, and a pair of guide covers 10 are provided below the spindle rail 9 along the row of spindles 7. The guide cover 10 is adjacent at one end (left end in Fig. 1) to a feed or removal conveyor 5, and at the other end, to a deflection rail (not shown). Note, as

this construction has no relation to the present invention, and thus a further explanation thereof will not be given.

As shown in Fig. 2, a bracket 2 projects from the frame 1 and holds a pair of rails 14 having a U-shaped cross-section opposite to each other with a narrow gap therebetween.

The guide cover 10 has an L-shaped cross-section and is fixed by screws to the side of the respective rail 14 so that a lengthwise extending space is formed between the upper surface of the rail 14 and the lower surface of the guide cover 10 for displacing the peg-trays 13.

The peg-tray 13 is molded from a plastic material and has a disc-like body having a peg 13a fixed on the upper side thereof for insertingly holding a bobbin, and a recess 13b formed on the lower side thereof.

An upper gap is formed between the guide covers 10 at the upper portion thereof, to allow the peg-tray 13 to pass while restricting the width-wise position of the peg-tray.

A concave 2a is formed on the bracket 2 in correspondence to a lower gap between the guide covers 10 at the lower portion thereof, through which is extended a driving bar 3, having a U-shaped cross-section, in a lengthwise direction of the spinning frame 1. As shown in Figs. 3 and 5, a downward projecting bracket 3a is fixed in the vicinity of the end area of the driving bar 3, to which is connected a piston rod 16a of a horizontal power cylinder 16 by a pin 17 through an adjustable turnbuckle 18. The cylinder 16 drives the piston rod 16a in a reciprocable manner at a stroke longer than the spindle pitch of the spinning frame, and accordingly, when the cylinder 16 is operated, the driving bar 3 is displaced in the lengthwise direction in a reciprocable manner by a predetermined stroke.

A plurality of positioning stops 4 are fixed by screws to the driving bar 3 at a pitch equal to a span of the spinning frame (see Fig. 1 and 5), and as shown in Fig. 4, the positioning stops 4 are provided with a pair of vertical slots 4a, 4b in the shape of a parallelopipedon, and a horizontal pin 4c is provided across the respective slots 4a, 4b.

As shown in Fig. 1, a tray-positioning bar 23 is provided between each adjacent stop 4 and is loosely fitted to the slots 4a, 4b by a guide portion 23b formed at the opposite ends thereof, so that an up-down movement of the guide portion 23b is allowed within a predetermined range.

A number of saw teeth-like engagement projections 23a equal to the number of spindles arranged between one span of the spinning frame are provided on the upper portion of the respective tray-positioning bar 23 at a pitch equal to the spindle pitch of the spinning frame, as shown in Fig. 1. The engagement projection 23a has an engagement surface projected vertically from the tray-positioning bar 23 and engageable with the recess 13b of the peg-tray 13, and is rearwardly inclined from the top of the engagement surface.

A blade spring 19 is secured on the upper side of the driving bar 3, to bias the tray-positioning bar 23 upward. This blade spring may be replaced by another resilient means such as a coil spring, etc.

As shown Fig. 1, during the forward displacement of the driving bar 3, the tray-positioning bar 23 is positioned at the leftmost end thereof by a vertical wall forming a bottom surface of the right-side slot 4a of the positioning stop 4, while being prevented by the pin 4c from removal from the slot 4a. Accordingly, the rightmost end of the tray-positioning bar 23 confronts a vertical wall of the slot 4b of the preceding stop 4 with a gap therebetween.

The operation of the apparatus described above will be explained.

Figure 6 (a) illustrates an initial positional relationship between a row of peg-trays 13 and the tray-positioning bar 23, in which the respective projection 23a enters the engagement recess 13b of the corresponding peg-tray 13 and remains there while confronting the right-side inner wall of the recess 13b with a predetermined gap therebetween. The respective peg-tray 13 occupies a position corresponding to that of the spindle of the spinning frame.

When the driving bar 3 is driven to move to the right in the drawing, the projection 23a of the tray-positioning bar 23 abuts the right-side inner wall of the recess 13b, as shown in Fig. 6 (b), and pushes the peg-tray 13 forward as the driving bar 3 moves further to the right. As shown in Fig. 6 (c), the respective peg-tray 13 occupies a new position forwarded by one spindle pitch from the initial position when the driving bar 3 reaches the foremost point of the stroke. If an outer diameter of the peg-tray 13 is made smaller by δ than the positioning pitch, i.e., spindle pitch, a gap δ exists between each adjacent peg-tray 3, as shown in the drawing.

Then the driving bar 3 is moved by a rearward stroke to drive the tray-positioning bar 23 to the left in the drawing. During this movement, the tray-positioning bar 23 is pushed down against the biasing force of the blade spring 19, because the inclined projection 23a is pushed by the left inner wall of the recess 13b of the peg-tray 13, whereby the projection 23a is allowed to pass under the peg-tray 13 as shown in Fig. 6 (d) and finally return to the position illustrated in Fig. 6 (a).

An alternative to the above positioning stop is shown in Fig. 7, in which, instead of the pair of vertical slots 4a, 4b, only one vertical slot 4d is

formed in the stop 4 and a pair of parallel pins 4c are across the same. In the tray-positioning bar 23, a vertically elongated aperture 23c is formed at the respective end area of the bar 23, and the respective
5 pin 4c is loosely fitted to the aperture 23c so that a position of the tray-positioning bar 23 in the lengthwise direction is restricted by the pin 4c while allowing the up-down movement of the bar 23 within a predetermined range.

10 The above explanation is based on the embodiment using a tray-positioning bar with engagement projections arranged at a pitch equal to the spindle pitch, but it is possible to arrange the engagement projections at a pitch equal to N times the spindle pitch (wherein N is a
15 natural number satisfying the following equation), so that each projection is assigned to a plurality of (N) peg-trays.

$$\Delta A \geq \Delta D \times N$$

20 wherein ΔD stands for a tolerance of the outer diameter of the peg-tray; and ΔA for a tolerance of a bobbin arrangement acceptable by an auto-doffer.

INDUSTRIAL APPLICABILITY

The present invention is applicable not only to bobbin transportation in a spinning frame but also to
25 the entire field of bobbin transportation in which bobbins are arranged in series at a predetermined pitch, such as in a twisting frame or a draw-twister.

CLAIMS

1. An apparatus for transporting full and empty bobbins in a spinning frame while mounting the respective bobbins on peg-trays (13) arranged in series on a conveying path arranged in front of the spinning frame, each of the peg-trays having a peg (13a) on the upper side thereof and an engagement recess (13b) on the lower side thereof, characterized in that

a driving bar (3) is provided along the conveying path and is displaceable in a lengthwise direction in a reciprocable manner by a stroke longer than a spindle pitch of the spinning frame, and a plurality of tray-positioning bar (23) are arranged in series on the driving bar (3) throughout the length thereof;

each of the tray-positioning bars (23) having a plurality of projections (23a) engageable with the recess (13b) of the peg-tray at a pitch corresponding to N times the spindle pitch, wherein N represents a natural number;

the tray-positioning bar (23) being held movably in the up-down direction on the driving bar (3) through spring members (19) as well as movably in the lengthwise direction together with the reciprocation of the driving bar (3).

2. An apparatus as defined in claim 1, characterized in that the projections (23a) of the tray-positioning bar (23) are arranged at a pitch equal to a spindle pitch of the spinning frame.

Fig.1

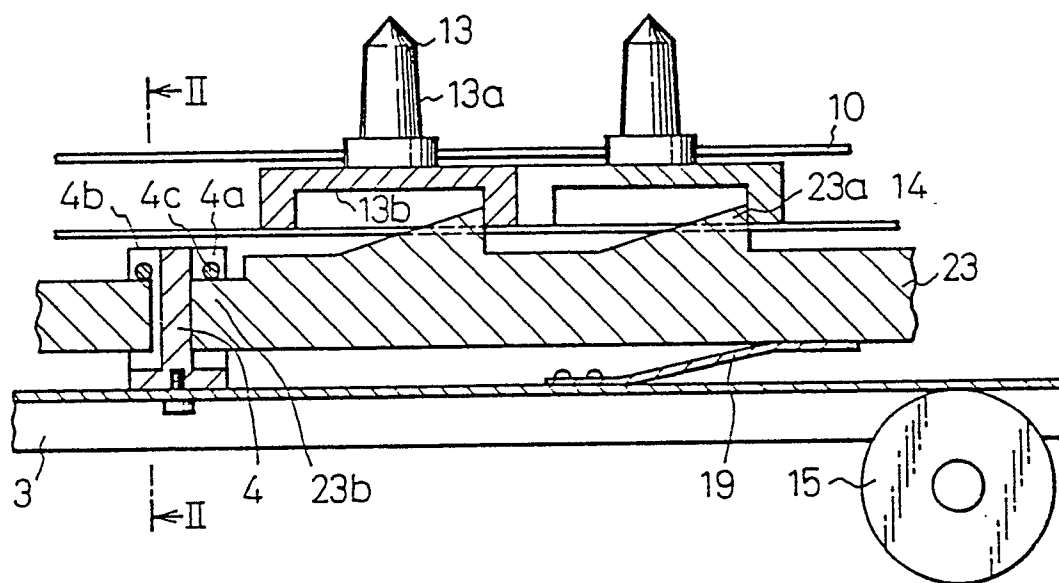
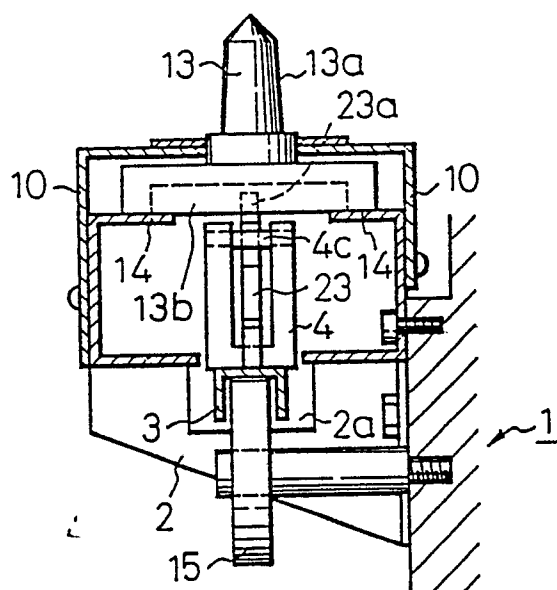
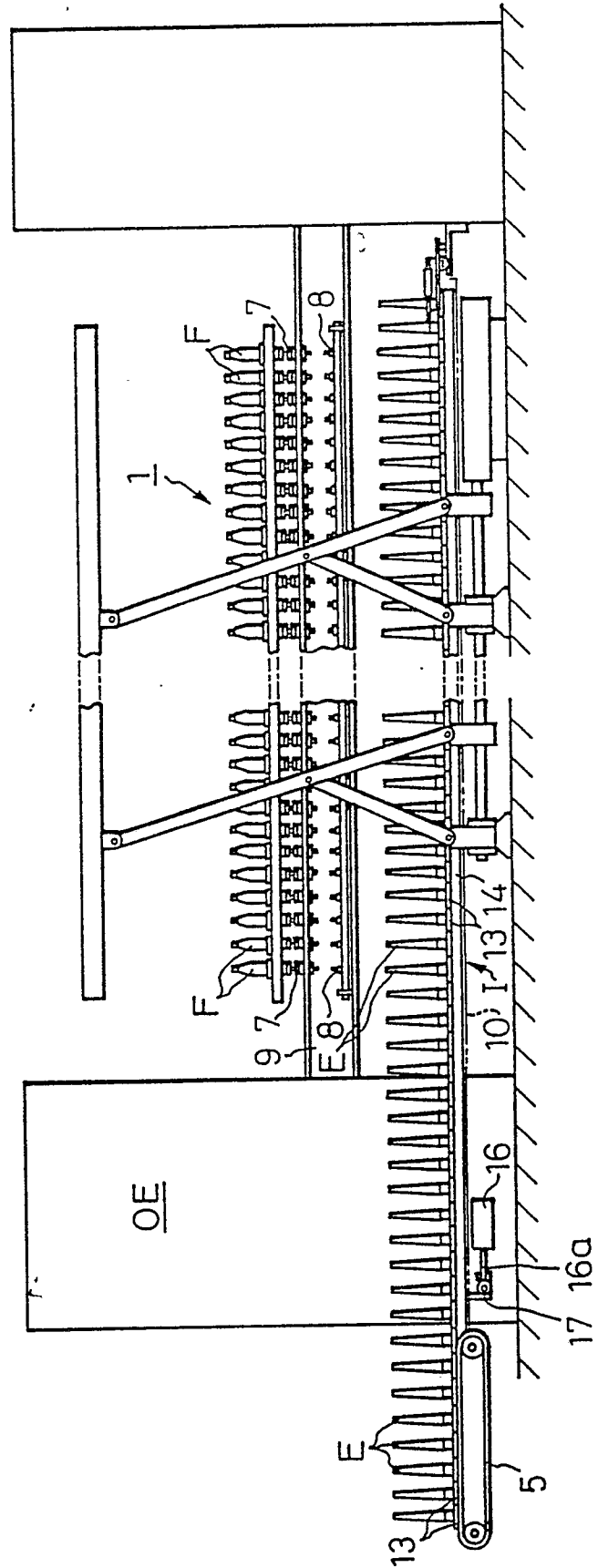


Fig.2



Fi. 3.



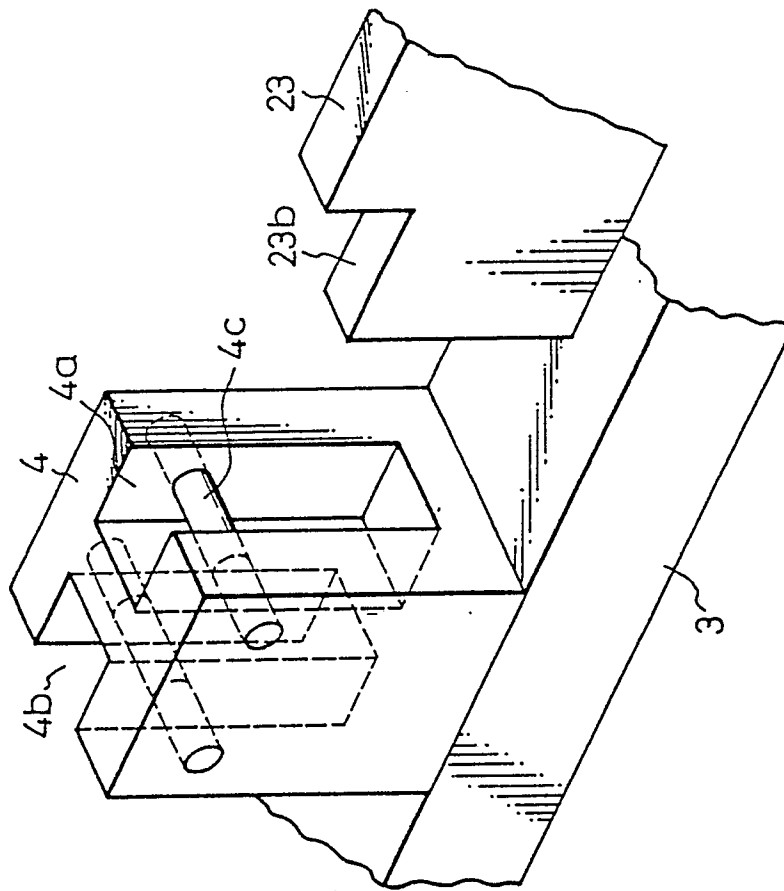


Fig. 4

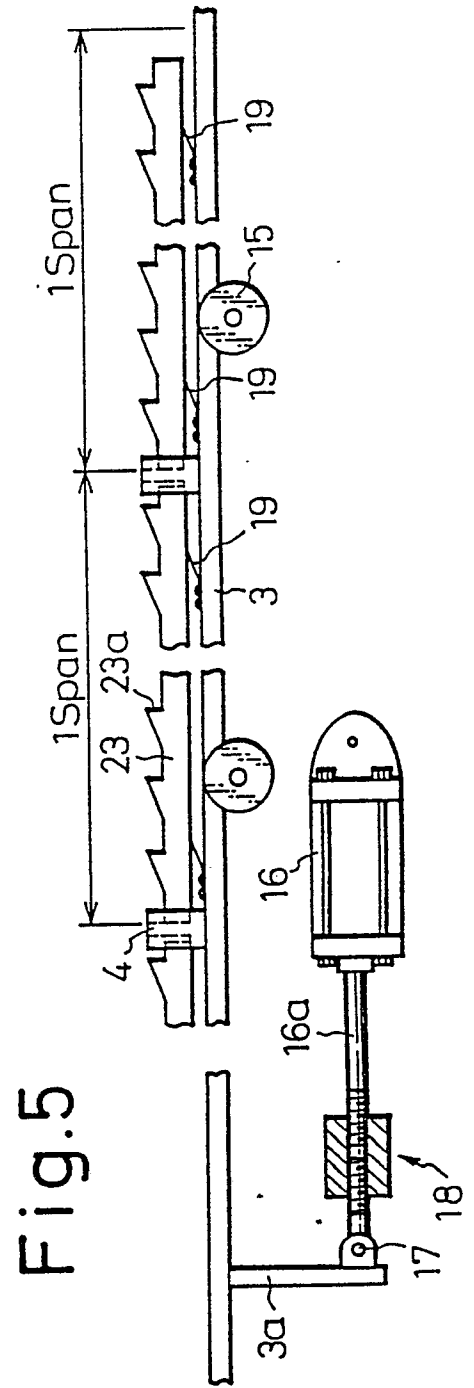


Fig. 5

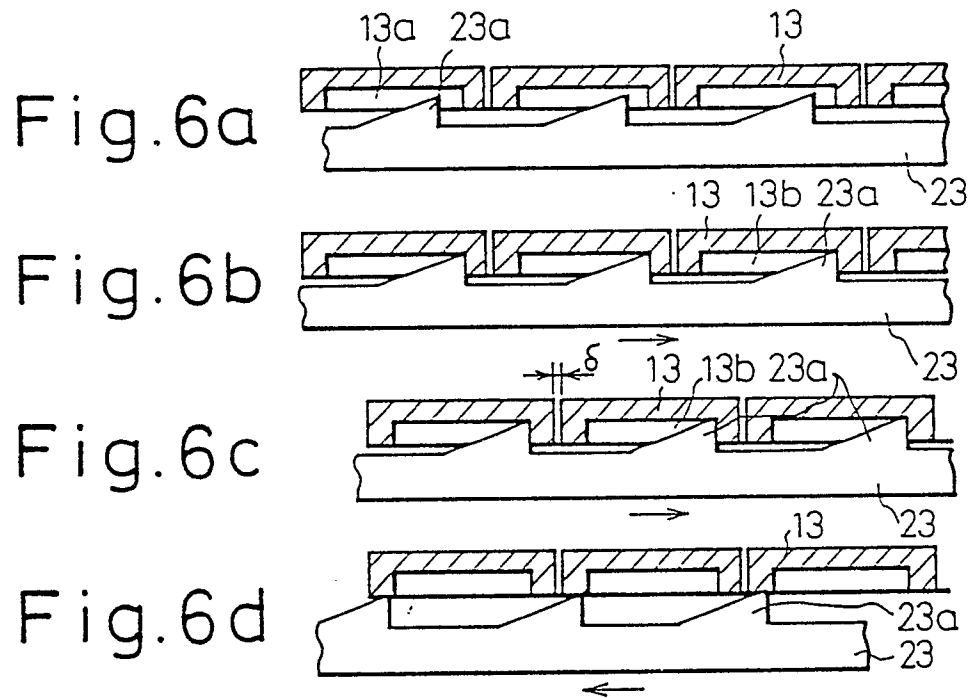
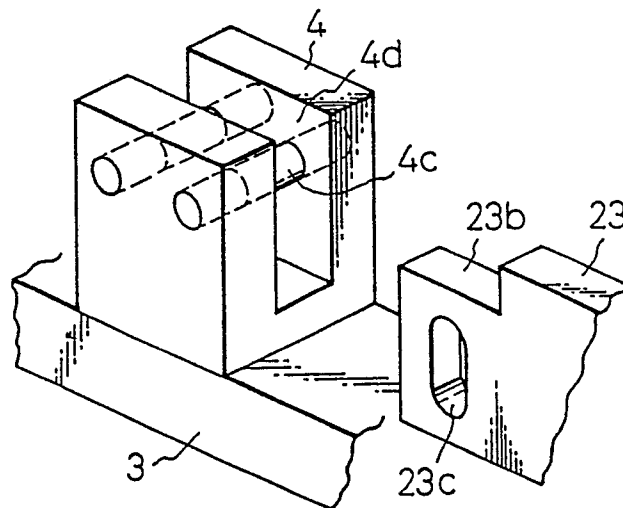


Fig. 7



INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP89/00076

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶
According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl⁴ D01H9/18

II. FIELDS SEARCHED

Minimum Documentation Searched ⁷

Classification System

Classification Symbols

IPC

D01H9/18

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched ⁸

Jitsuyo Shinan Koho

1926 - 1988

Kokai Jitsuyo Shinan Koho

1971 - 1988

III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	JP, B2, 63-9050 (Howa Kogyo Kabushiki Kaisha, Nisshinbo Industries, Inc.) 25 February 1988 (25. 02. 88) Fig. 6 and Fig. 12	1, 2
Y	JP, Y1, 43-9463 (OM Seisakusho Kabushiki Kaisha) 24 April 1968 (24. 04. 68) Fig. 2 and Fig. 6	1, 2

¹⁰ Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

March 24, 1989 (24. 03. 89)

Date of Mailing of this International Search Report

April 10, 1989 (10. 04. 89)

International Searching Authority

Japanese Patent Office

Signature of Authorized Officer