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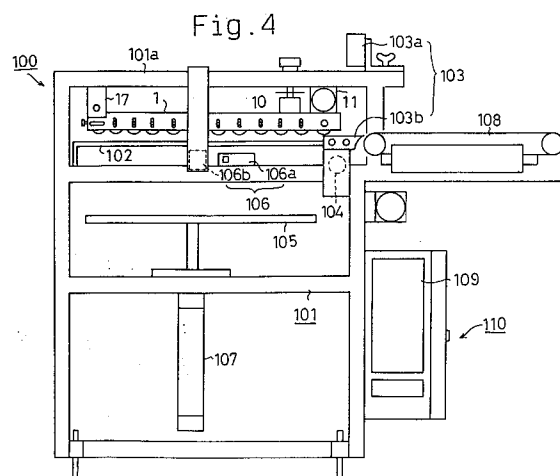
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Leeds LS2 8PA West Yorkshire(GB)(54) **STACKER.**

(57) A stacker for transferring and recovering a plurality of works formed of a fabric in an external apparatus. Works are each held at a plurality of positions spaced apart from one another and transferred by a roller conveyor (1). A table (102) facing the conveyor (1) from below supports the works conveyed by the conveyor (1), moves away from the position opposing the conveyor (1) when a work is conveyed to a predetermined position, and lets the work fall onto a receiving tray (105).



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TECHNICAL FIELD

This invention relates to a stacker for stacking works, more particularly to an improvement of the conveying section for carrying the works into the main body of the stacker.

BACKGROUND ART

In textile plants and the like, cut pieces of textile and lining are bonded by a hot press and then fed to a stacker to be stacked one after another. This type of stacker is disclosed in West German Patent Laid-open Application (DE-OS) No. P1660982.8 and Japanese Examined Utility Model Publication No. 42532/1986. This type of stacker uses a belt conveyor as a means for carrying works each consisting, for example, of a textile and a lining bonded together by a hot press. On the base of the stacker, a table is disposed in such a way that it can move between an operating position and a retracted position. When the table is at the operating position, it is designed to very closely oppose the lower surface of the conveyor. The work fed from the press is then carried over and pressed against the table by the conveyor as the conveyor belt turns. When the work is carried to a predetermined position, the table moves back to the retracted position, and thus the work drops downward and is stacked or collected on a collecting section.

However, if static electricity accumulates on the belt and the works due to friction, the works are attracted by the belt due to the action of electrostatic forces exerted between them. Occasionally, when the table is moved back to the retracted position, a portion of the work is strongly attracted to the belt and thus does not drop neatly onto the stacking table. If it happens, the works may not be stacked in a good condition. That is, it may be folded or wrinkled. If this occurs, the stacker's intended purpose of stacking works in good order is not achieved.

After a number of works have been carried or when the works are of a mixed fiber fabric of chemical fibers, a relatively high level of electrostatic charge will be generated. Thus, the works sometimes adhere onto the belt and are reluctant to drop. If the following works are nevertheless carried in one after another, the works jam around the dropping position, and these works must be stacked manually by an operator.

It has been contemplated to add a static discharger to the stacker for preventing the affect of static electricity or to use a conductive fiber. However, the static induction increases to the maximum level at the moment the work and the table are separated from each other.

For example, when a work of 100 % polyester fabric is carried by a Teflon type belt, the level of static electricity at the moment the table is retracted jumps up to 10 to 20 KV which is at least 10 times the value before retraction (measured by a collecting type measuring instrument Model KS-525, manufactured by Kasuga Denki Kabushiki Kaisha).

No existing static discharger can remove such a great level of static electricity momentarily and entirely from the work. Even in those stackers having antistatic equipment, portions of the works are often attracted strongly enough by the belt to cause disorder in the stacking of the works. Moreover, if a static discharger is incorporated into the stacker, the entire stacker unit becomes larger. On the other hand, if a conductive fiber is used, the cost of the work is increased.

Further, while a method of removing static electricity by spraying ion onto the belt using a corona discharger has been proposed, it is known that this method can exhibit no effect of removing static electricity in a stacker of the type in which works are brought into close contact with the belt.

DISCLOSURE OF THE INVENTION

Therefore, it is an object of this invention to minimize the size of the entire stacker unit, to allow use of inexpensive works and to eliminate the affect on the works by the static electricity, so as to provide a stacker which ensures loading and collection of works in good order.

This invention has been proposed with a view to solving all the problems mentioned above. The stacker of this invention receives a plurality of works fed successively from an external unit. The works are collected and stacked onto a collecting section. The stacker is characterized in that the stacker has a conveying means for carrying each work by holding it at several positions. A work dropping means disposed under the conveying means and opposite thereto supports the work carried by the conveying means. The work dropping means retracts from the position where it opposes the conveying means when the work is carried to a predetermined position to allow the work to drop onto a collecting section.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view of a roller conveyor in the stacker of this invention;

Fig. 2 is a side view of the roller conveyor as viewed from the work supply side;

Fig. 3 illustrates the principle of driving the roller conveyor;

Fig. 4 is a front view of the stacker;

Fig. 5 is a block diagram showing the electrical system of this invention;

Fig. 6 is a side view of the stacker shown in Fig. 4; and

Fig. 7 is a partially cut-away plan view of another embodiment of roller conveyor.

BEST MODE FOR CARRYING OUT THE INVENTION

A preferred embodiment of this invention will now be described below in detail referring to Figs. 1 to 7.

In Fig. 4, a stacker generally shown with the reference number 100 is disposed adjacent to a press not shown. A work formed by subjecting a lining and a fabric to hot pressing is fed to the stacker 100 via a belt conveyor 108. The stacker 100 has a substantially rectangular metallic main body 101 as a basic framework. A roller conveyor 1 for carrying the work therein is suspended from the top rail 101a of the main body 101 via a bracket 17 and an adjuster 15.

As shown in Fig. 1, the roller conveyor 1 consists of a long plate-like metal frame 5 and a plurality of rolls 3 arranged to extend horizontally parallel to one another in the metal frame 5. It should be noted that the rear end (left end in Fig. 1) portion of the frame 5 is supported on the bracket 17 to be movable vertically.

As shown in Fig. 2, each roll 3 consists of three rollers 3a made of a urethane rubber. These rollers 3a are rotatably supported on the metal frame 5 by a shaft 7. The rolls 3 are arranged in such a way that the lower portions thereof extend below the lower edges of the side panels of the frame 5, as shown in Fig. 1. Referring again to Fig. 2, a toothed pulley 4 is interposed between each pair of rollers 3a of each roll 3. A timing belt 2 is extended along the longitudinal axis of the frame 5 over each row of toothed pulleys 4.

As shown in Figs. 1 and 3, a tension roll 6 rotatably supported on the metal frame 5 is disposed between each pair of rolls 3 so as to apply appropriate tension to the timing belt 2 and maintain good engagement between the toothed pulleys and the timing belt 2. Guide rolls 6a are rotatably disposed adjacent to the two outermost rolls 3 of the roller conveyor 1 so as to allow the timing belts 2 to be spaced from the lower portions of the toothed pulleys 4.

The foremost shaft 7 has a driven toothed pulley 13 at one end thereof as shown in Fig. 2. A drive toothed pulley 14 is disposed on the output shaft of a motor 11 mounted on the front end portion of the frame 5 as shown in Fig. 1, and a timing belt 12 is extended over these two pulleys 13,14. When the driven pulley 13 is rotated by the

motor 11, the toothed pulleys 4 are driven via the timing belts 2 to rotate the rolls 3.

Referring now to the adjuster 15, a pneumatic cylinder 10 is disposed on the frame 5 behind the motor 11. The pneumatic cylinder 10 allows the roller conveyor 1 to operate vertically. The pneumatic cylinder 10 has two knobs 10a,10b, and the operational speed of the pneumatic cylinder 10 can be controlled by suitably manipulating these two knobs 10a,10b. A bolt 15b is attached to the upper end of the rod of the pneumatic cylinder 10 via a connecting piece 19. The upper end of the bolt 15b is connected to a knob 15a disposed on the top rail 101a, and the height of the roller conveyor 1 can be adjusted by operating the knob 15a.

A horizontal slot 9 is formed at the rear end portions on the side panels of the frame 5 so that the rearmost shaft 7 can move horizontally within the slot 9 via an adjusting mechanism (not shown) by operating a tension bolt 8 screwed into the frame 5. In this manner, the tension to be applied to the timing belts 2 can be adjusted.

Further, a row of vertical slots 18 are defined on the side panels of the frame 5. The shafts 7 inserted through these slots 18 are constantly urged downward by the tension of the timing belt 2. Incidentally, the stopper 18a shown in Fig. 2 is intended to prevent axial dislocation of the shaft 7.

As shown in Fig. 6, a slide table 102 is disposed below the roller conveyor 1, which can move between the operating position (shown by the broken line in Fig. 6) and the retracted position (shown by the solid line) in the housing 120 disposed behind the main body 101 with the operation of the table driving cylinder 104 (see Fig. 4). At the operating position, the slide table 102 carries a work in cooperation with the rolls 3, while it allows the work to drop onto a tray 105 when it moves back to the retracted position.

As shown in Fig. 4, a light emitter 103a and a light receptor 103b, which together constitute a work sensor 103 are disposed on each side of the top rail 101a. When the work sensor 103 detects a start of the operation of carrying in a work at the roller conveyor 1, the pneumatic cylinder 10 and motor 11 are actuated. Upon detection of completion of the carry-in operation at the roller conveyor 1 by the work sensor 103, the rod of the table driving cylinder 104 extends to return the slide table 102 from the operating position to the retracted position. In synchronization with the retracting motion of the slide table 102, the motor 11 is stopped and the pneumatic cylinder 10 is retracted to resume the original posture so as to lift the roller conveyor 1 to the original position.

The tray 105 is mounted on the rod 107a of a pneumatic tray supporting cylinder 107 disposed in the bottom of the main body 1, which operates so

as to move the tray 105 up and down. A load sensor 106 consisting of a light emitter 106a and a light receptor 106b is disposed between the tray 105 and the slide table 102. The load sensor 106 detects the height of the stacked works stacked on the tray 105. The tray supporting cylinder 107 is designed to automatically adjust the distance between the top of the stacked works and the slide table 102 to maintain a constant separation based on the detection data of the load sensor 106.

A control box 110 is disposed below the belt conveyor 108 for transferring works from the press into the stacker 100. The control box 110 has a control panel on the surface thereof, and a controller 111 disposed therein as shown in Fig. 5. The controller 111 controls operation of the stacker by driving solenoid valves 113, 114 and 115 based on the output signals of the respective sensors.

More specifically, when the work sensor 103 detects that a work is being carried to the roller conveyor 1, it outputs a start signal to the controller 111. When the work sensor 103 detects completion of the work carry-in operation at the conveyor 1, it outputs an end signal to the controller 111.

When the load sensor 106 detects that the height of the works stacked on the tray 105 has not reached yet a predetermined level, it outputs a signal to that effect (space-left signal) to the controller 111. When the load sensor 106 detects that the height of the works stacked on the tray 105 has reached the predetermined level, it outputs a signal to that effect (space-full signal) to the controller 111.

Upon receipt of the start signal, the controller 111 drives the motor 11 via a motor driver 112. At the same time, the controller 111 also operates the solenoid valve 113 so as to supply air to one chamber of the pneumatic cylinder 10 and evacuate air from the other chamber thereof, whereby the cylinder 10 is pushed out.

Upon receipt of the end signal, the controller 111 changes over the solenoid valve 113 so as to evacuate air from one chamber of the pneumatic cylinder 10 and supply air to the other chamber thereof, whereby the pneumatic cylinder 10 is retracted. At the same time, the controller 11 also operates the solenoid valve 114 so as to supply air to one chamber of the table driving cylinder 104 and evacuate air from the other chamber thereof, whereby the rod of the table driving cylinder 104 is pushed out. Immediately after completion of this operation, the controller 111 changes over the solenoid valve 114 to assume its original posture so as to retract the rod of the cylinder 104.

The controller 111 controls the solenoid valve 115 based on the space-not-full signal from the load sensor 106 so as to supply air to one chamber of the tray supporting cylinder 107 and evacuate

air from the other chamber thereof, whereby the rod of the tray supporting cylinder 107 is pushed out. Upon receipt of the space-full signal from the load sensor 106, the controller 111 maintains the solenoid valve 115 in the state and allows the tray supporting cylinder 107 to keep this position.

Now, use of this stacker 100 will be described below. A work is first carried to the stacker 100 by the belt conveyor 108 and then carried into the main body 101 of the stacker 100. When the work sensor 103 detects this, the pneumatic cylinder 10 is extended to push down the roller conveyor 1, whereby the roller conveyor 1 is pivoted down on the bracket 17. At the same time, the motor 11 is driven to rotate the rolls 3, whereby the work is carried to the predetermined position by the cooperation of the rolls 3 and slide table 102. Upon completion of the work carry-in operation by the work sensor 103, the table driving cylinder 104 is actuated to move the slide table 102 to the retracted position, whereby the work drops to the tray 105 and stacked thereon.

Meanwhile, the motor 11 is stopped in synchronization with the retraction of the slide table 102 to lift the roller conveyor 1 by the retraction of the cylinder 10 and assume a stand-by posture. The slide table 102 quickly returns to the original position after dropping of the work. As the number of the works stacked on the tray 105 increases, the piston rod of the tray supporting cylinder 107 is retracted to move down the tray 105 little by little.

Since the work is carried into the stacker 100 by the roller conveyor 1 in the above embodiment, the work is designed to be brought into contact with the lower portion of each roll 3, in contrast with the conventional belt conveyor where the upper surface of the work is brought into contact with the entire surface of the belt. Accordingly, the contact area of the work with the roller conveyor 1 in this embodiment is very smaller than in the conventional conveyor, so that it never happens that the works are prevented from being released from the roller conveyor 1 by the static electricity exerted therebetween.

Moreover, the contact area with the work in each roll 3 of the roller conveyor 1 is designed to be reduced by constituting each roll 3 with three rollers 3a, so that the effect described above can be exhibited more remarkably.

Since two timing belts 2 are extended over the respective rows of toothed pulleys 4 interposed between the rollers 3a, the tension of the timing belts 2 can be applied evenly over the depth of the roller conveyor 1. Thus, the noise generated by the interference between the metal parts of the rollers 3a and the toothed pulleys 4 or abrasion of these parts and member can be prevented.

In addition, by the acts of the tension bolt 8,

slot 9 and slots 18, the tension applied to the timing belts 2 can be adjusted. Accordingly, since the tension applied by the timing belts 2 to the rolls 3 can in turn be adjusted, the force applied to the work can be adjusted so as to comply with the kind of cloth.

In the above embodiment, the respective cylinders are designed to be driven by the controller 111 in response to the conditions sensed by the respective sensors. This control covers the entire process from the introduction of the works to the stacking thereof onto the tray 105. Thus minimal manual operation is required and the stacking operation can be facilitated.

This invention can also be embodied as follows:

(1) The rollers 3a can be arranged alternately as shown in Fig. 7. In this arrangement, the contact area of the work with the rollers 3a can be further reduced, and this arrangement is more effective for the mixed fiber fabric of chemical fibers which suffers notable generation of static electricity.

(2) The three rollers 3a constituting each roll 3 may be replaced by a multiplicity of discs. This constitution of the roll 3 can even further reduce the contact area of the work with the rolls 3. Thus a further reduction of the electrostatic interaction can be achieved.

(3) The surface of the roll 3 may be knurled so as to prevent slipping of the work.

(4) The pneumatic cylinder may be replaced with a hydraulic cylinder.

(5) An industrial sewing machine may be used in place of the press as an apparatus for supplying works to the main body 101 of the stacker 100.

Claims

1. A stacker for carrying a plurality of works that are fed successively from an external apparatus, and which collects and stacks the works onto a work collecting section (105) provided in the main body (101) thereof, comprising:

conveying means (1) for holding each work at places separated from one another and carrying the work into the stacker; and

work dropping means (102) which disposed to be able to oppose upward to the conveying means (1) and supports thereon the work carried in by the conveying means (1), and which retracts from the position where it opposes to the conveying means (1) when the work is carried to a predetermined position so as to allow the work to drop onto the work collecting section (105).

2. A stacker according to Claim 1, wherein the conveying means (1) includes a plurality of rolls (3).

3. A stacker according to Claim 2, wherein the rolls (3) each include a plurality of rollers (3a) arranged widthwise.

4. A stacker according to anyone of preceding claims, wherein the conveying means (1) has descending means (10) which normally maintains the conveying means (1) up at the standby position, and which moves the conveying means (1) down to the operating position only when a work is carried in.

5. A stacker according to Claim 4, which further has work detecting means (103) which detects the timing when carrying in of the work transferred from the external apparatus to the conveying means (1) is started; and driving means (111,113) for descending the descending means (10) based on the detection data by the work detection means (103).

6. A stacker according to anyone of preceding claims, wherein the work dropping means includes a table (102) which can move above the work collecting section (105) and between the operating position and the retracted position and a table driving means (104) for moving the table (102).

7. The stacker according to Claim 6 further including end detection means (103) which detects completion of carrying in the work to the conveying means (1); and control means (111,114) for driving the table driving means (104) based on the detection data of the end detection means (103).

8. The stacker according to anyone of the preceding claims, wherein the collecting section is a tray (105) which receives the works, and the tray (105) is ascended or descended by an ascending means (107).

9. The stacker according to Claim 1 further including height detection means (106) which detects if the height of the works collected on the tray (105) has reached a predetermined level or not; and means (111,115) for driving the ascending means (107) to ascend or descend based on the detection data of the height detection means (106).

Amended claims

1. (Amended) A stacker for carrying a plurality of works that are fed successively from an external apparatus, and which collects and stacks the works onto a work collecting section (105) provided in the main body (101) thereof, comprising:
 - a plurality of rollers (3) which hold each work at places along the direction of advancing of the work and carry the work into the stacker;
 - each roller (3) including roller pieces (3a) separated from one another widthwise; and
 - work dropping means (102) which is disposed to be able to oppose upward to the rollers (3) and supports thereon the work carried in by the rollers (3), and which retracts from the position where it opposes to the rollers (3) when the work is carried to a predetermined position so as to allow the work to drop onto the work collecting section (105).
2. (Canceled)
3. (Canceled)
4. (Amended) A stacker according to Claim 1 further including descending means (10) which normally maintains the rollers (3) up at the stand-by position, and which moves the rollers (3) down to the operating position only when a work is carried in.
5. (Amended) A stacker according to Claim 4 further including work detecting means (103) which detects the timing when carrying in of the work transferred from the external apparatus to the rollers (3) is started; and driving means (111,113) for descending the descending means (10) based on the detection data by the work detection means (103).
6. A stacker according to anyone of the preceding claims, wherein the work dropping means includes a table (102) which can move above the work collecting section (105) and between the operating position and the retracted position and table driving means (104) for moving the table (102).
7. (Amended) A stacker according to Claim 4 further including end detection means (103) which detects completion of carrying in the work to the rollers (1); and control means (111,114) for driving the table driving means (104) based on the detection data of the end detection means (103).
8. A stacker according to anyone of the preceding claims, wherein the collecting section is a tray (105) which receives the works, and the tray (105) is ascended or descended by an ascending means (107).
9. A stacker according to Claim 1 further including height detection means (106) which detects if the height of the works collected on the tray (105) has reached a predetermined level or not; and means (111,115) for driving the ascending means (107) to ascend or descend based on the detection data of the height detection means (106).

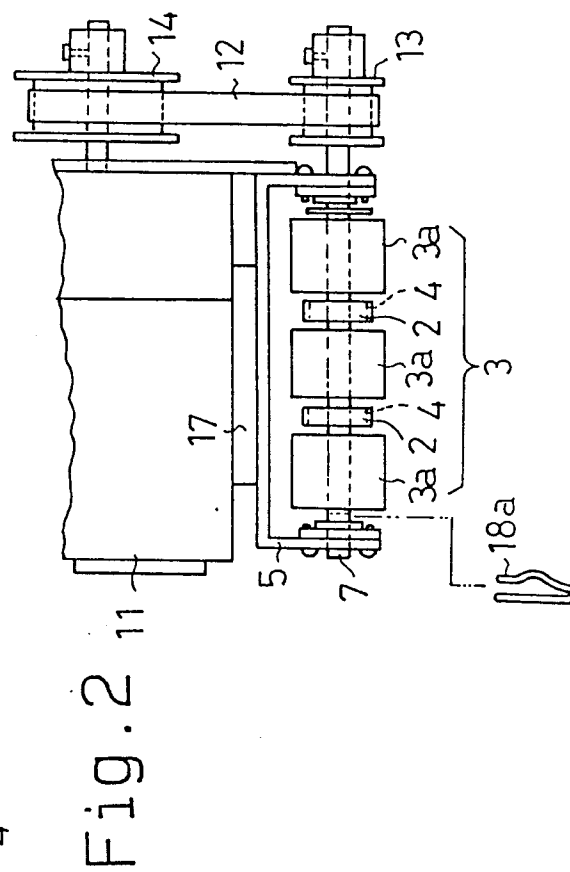
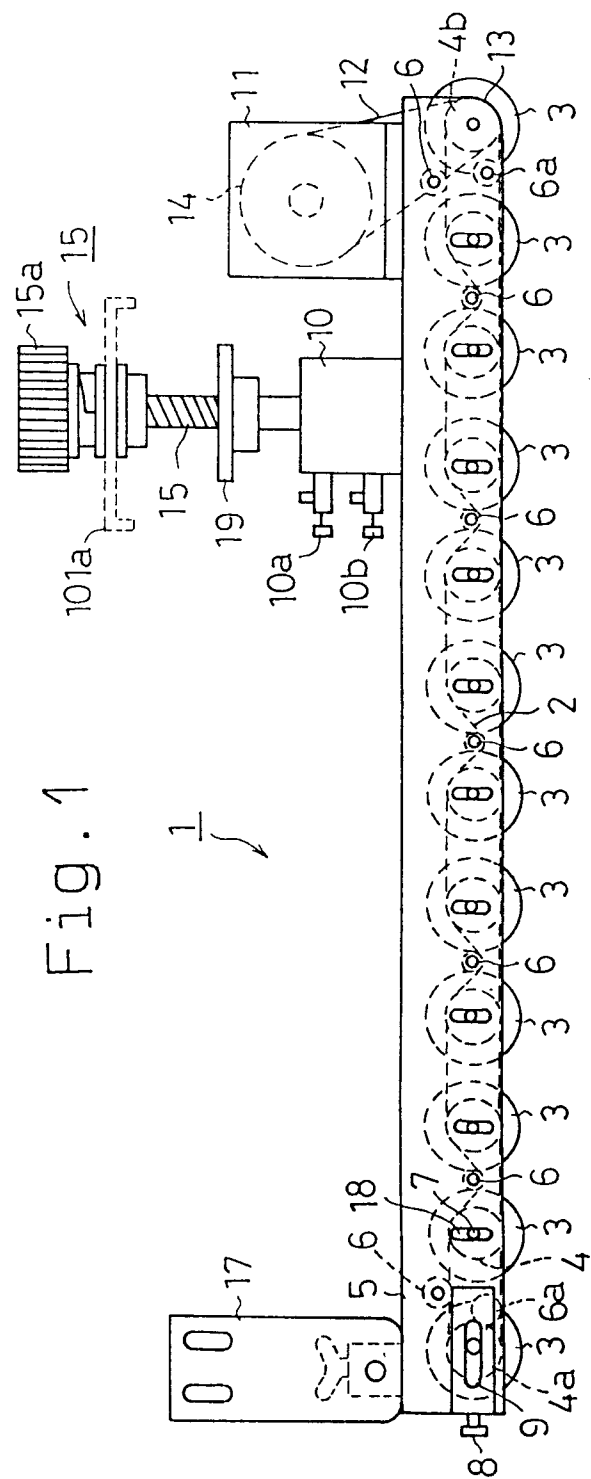
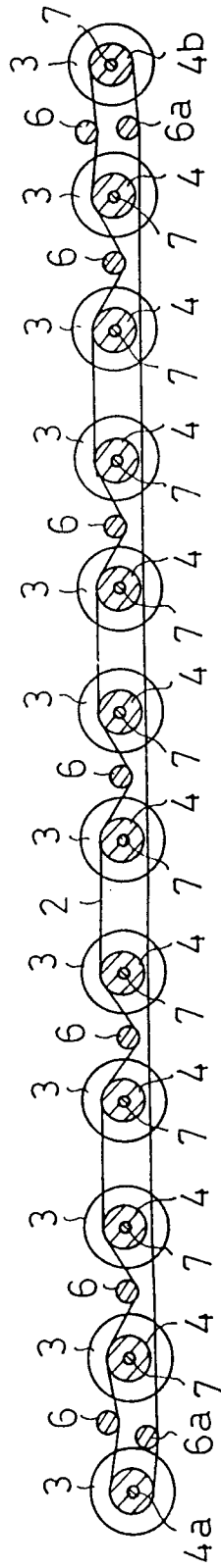


Fig. 3.



7. 6. 7.

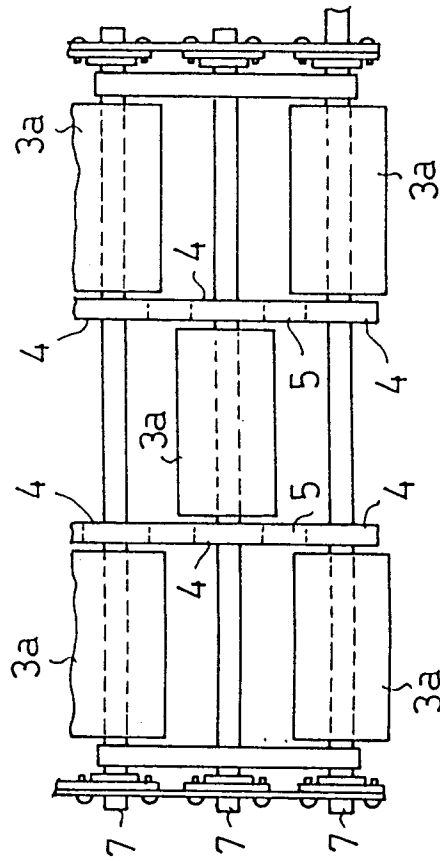


Fig. 4

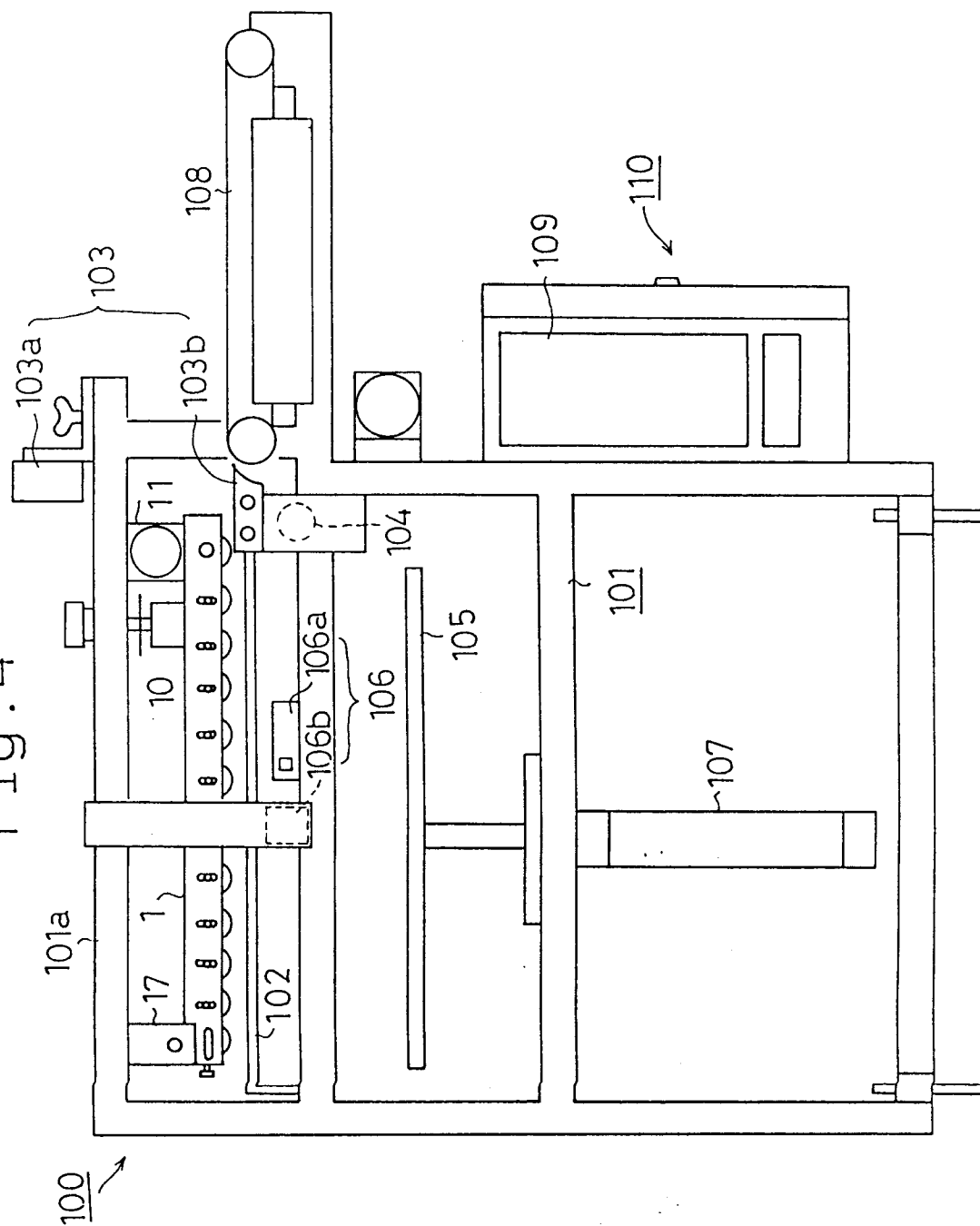


Fig.5

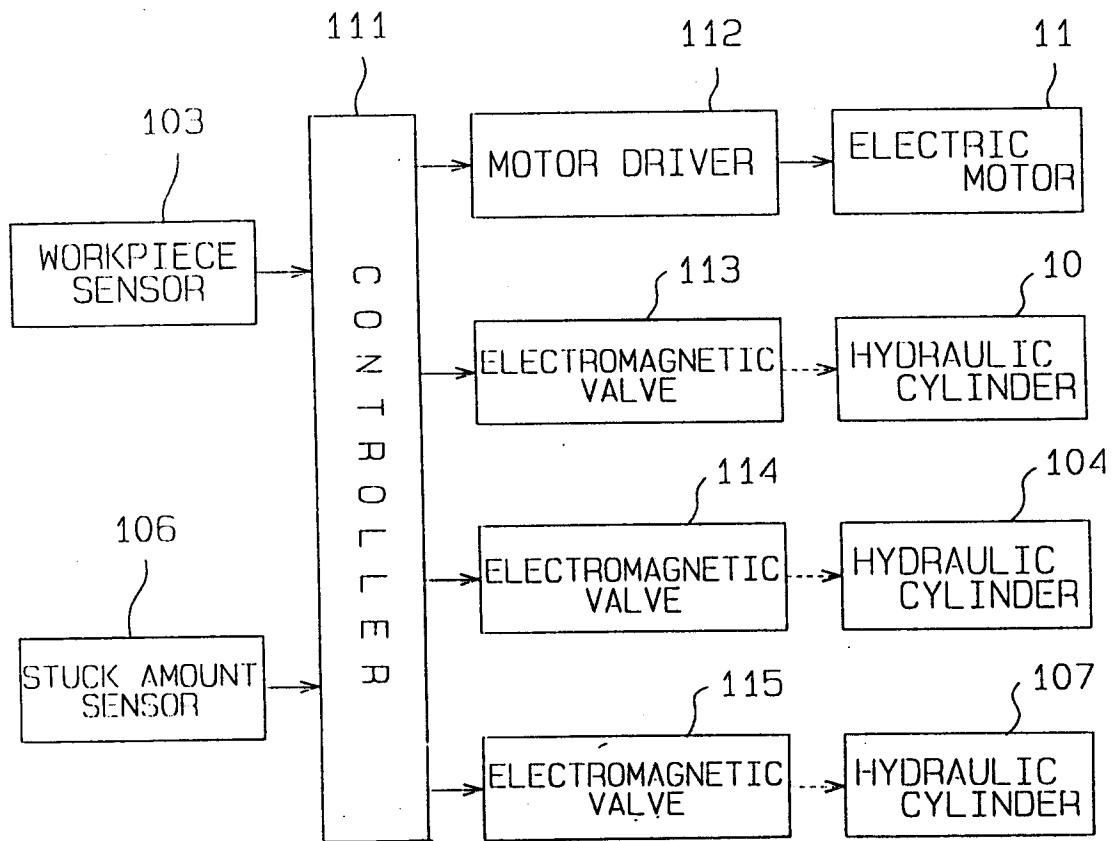
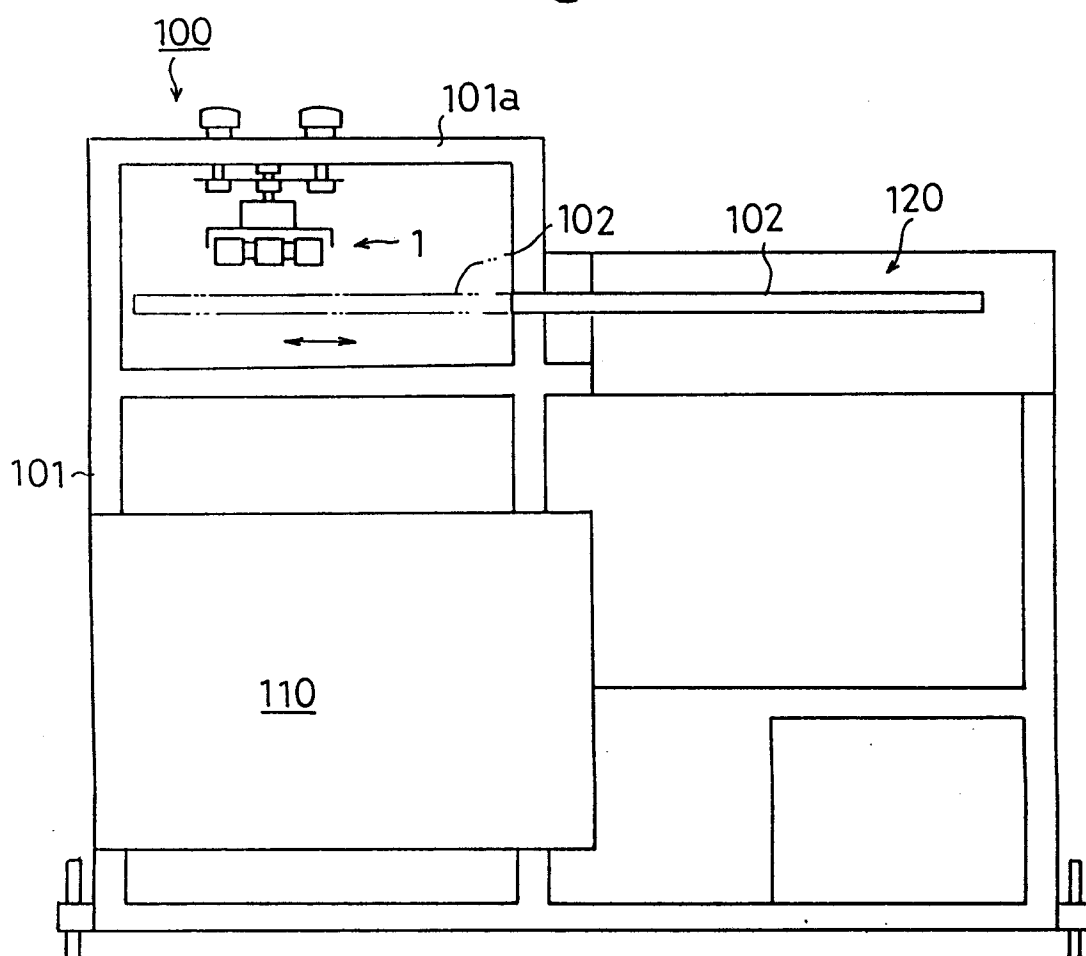


Fig.6



INTERNATIONAL SEARCH REPORT

International Application No PCT/JP91/00562

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. Cl ⁵ D05B41/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC	D05B41/00, 33/00-33/02	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁸		
Jitsuyo Shinan Koho 1926 - 1991 Kokai Jitsuyo Shinan Koho 1971 - 1991		
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
X	JP, U, 59-105477 (K.K. Kurodaruma Otsubo Kojo), July 16, 1984 (16. 07. 84), (Family: none)	1, 4-9
X	JP, U, 1-76775 (Shinmei Hifuku K.K.), May 24, 1989 (24. 05. 89), (Family: none)	1, 4-7
X	JP, Y2, 61-42532 (Hajima K.K.), December 2, 1986 (02. 12. 86), (Family: none)	1, 4-9
Y	JP, B2, 2-20274 (Kyushu MIC K.K.), May 8, 1990 (08. 05. 90), (Family: none)	1-5
Y	JP, U, 59-105477 (K.K. Kurodaruma Otsubo Kojo), July 16, 1984 (16. 07. 84), (Family: none)	2-3
¹⁰ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specific) "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 "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
June 10, 1991 (10. 06. 91)		June 24, 1991 (24. 06. 91)
International Searching Authority		Signature of Authorized Officer
Japanese Patent Office		

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	JP, Y2, 61-42532 (Hajima K.K.), December 2, 1986 (02. 12. 86), (Family: none)	2-3
A	JP, B2, 57-22598 (Queen Light Denshi Seiko K.K.), May 13, 1982 (13. 05. 82), (Family: none)	1-3
A	JP, U, 54-116374 (Aishin Seiki Co., Ltd.), August 15, 1979 (15. 08. 79), (Family: none)	1-9

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers , because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers , because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.