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(71) Applicant: **MITSUBISHI JUKOGYO KABUSHIKI KAISHA**
5-1, Marunouchi 2-chome Chiyoda-ku
Tokyo 100(JP)

(72) Inventor: **Seki, Yukuharu Mihara Machinery Works of**
Mitsubishi Jukogyo K.K. 5007 Itozaki-cho
Mihara-shi Hiroshima-ken(JP)
Inventor: **Kiyohara, Tadashi Mihara Machinery Works of**
Mitsubishi Jukogyo K.K. 5007 Itozaki-cho
Mihara-shi Hiroshima-ken(JP)

(74) Representative: **Henkel, Feiler, Hänzel & Partner**
Möhlstrasse 37
D-8000 München 80(DE)

(54) Conveying and stacking apparatus for sheets.

(57) The known converying and stacking apparatus for sheet bodies of the type that the apparatus includes a conveyor for continuously conveying sheet bodies and a stacking table on which sheet bodies ejected from an end of the conveyor on the downstream side in the conveying direction are stacked, and the sheet bodies are separated at every predetermined number of sheets and then conveyed and stacked, is improved in that at least one suction pad is disposed at an inlet portion of the conveyor and adapted to selectively suck and stop the sheet body, and a plate is disposed on the downstream side of the suction pad so as to be freely projected into and retracted from a conveying route of the sheet bodies.

Fig. 1

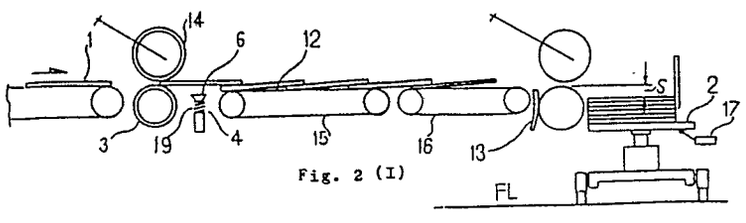

Fig. 2 (I)

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CONVEYING AND STACKING APPARATUS FOR SHEET BODIES

BACKGROUND OF THE INVENTION:

Field of the Invention:

The present invention relates to a conveying and stacking apparatus for sheet bodies in which sheet bodies such as corrugated cardboard sheets or the like are conveyed and stacked on a stacking table in a laminated state.

Description of the Prior Art:

At first, a conveying and stacking apparatus for corrugated cardboard sheets in the prior art will be described with reference to Fig. 4, in which Fig. 4(I) shows the entire construction of the same conveying and stacking system and Fig. 4 (II) shows a portion A in Fig. 4(I) in an enlarged scale. In Figs. 4(I) and 4(II), reference numeral (1) designates a corrugated cardboard sheet, numeral (2) designates a stacking table, numeral (3) designates a feed roll, numeral (14) designates a press roll, numeral (15) designates a first conveyor, numeral (16) designates a second conveyor, numeral (12) designate a conveying surface of the respective conveyors (15) and (16), numeral (17) designates a limit switch, numeral (18) designates an intermediate stopper disposed between the first conveyor (15) and the second conveyor (16). After a web of corrugated cardboard has been cut into a plurality of pieces in the conveying direction, the respective pieces are cut into a predetermined length in the widthwise direction by means of a cut-off and thus formed into corrugated cardboard sheets (1), and this corrugated cardboard sheet (1) is conveyed via an outlet side conveyor of the cut-off and enters the feed roll section (3), where it is pinched by the press roll (14) and forcibly ejected onto the first conveyor (15). The first conveyor (15) is operated at a lower speed than the circumferential speed of the above-mentioned feed roll (3) and press roll (14), hence the corrugated cardboard sheets (1) ejected onto the first conveyor (15) are subjected to "shingling" (operation of stacking in a roof tile form), then they are ejected one by one onto the stacking table (2) via the second conveyor (16), and they are stacked on the stacking table (2) in a laminated state. At this moment, an upper surface level of the corrugated cardboard sheets (1) stacked in a laminated state on the stacking table (2) is detected by means of a photo-electric tube or the like, the detection signal obtained at that time is sent to an elevator driving device for the stacking table (2), so that the same elevator driving device would lower the stacking table (2) in accordance with the stacked amount, and thereby a level difference (5) between the ejecting end of the second conveyor (16) and the upper surface of the corrugated cardboard sheets (1) stacked in a laminated state on the stacking table (2) is maintained nearly constant. When the corrugated cardboard sheets (1) have be stacked on the stacking table (2) by a predetermined amount, the limit switch (17) operates, and thereby the stacking table (2) is lowered. In addition, the second conveyor (16) stops, and the stacked corrugated cardboard sheets are delivered jointly with the stacking table (2) from the stacking position to the next step of the process. Also, at this moment, a conveying speed of the first conveyor (15) is switched to a low speed, a new stacking table (2) is brought to the above-mentioned stacking position and set there, and after an initial condition has been set, the second conveyor (16) is started and the corrugated cardboard sheets (1) held in a standby state would begin to be fed to the new stacking table (2). Upon this recommencement of feeding the second conveyor (16) is operated at a somewhat higher speed, so that the corrugated cardboard sheets (1) which are stagnating during the resetting of the stacking table (2) are quickly ejected onto the stacking table (2). Also, when these stagnating corrugated cardboard sheets (1) have been eliminated, the second conveyor (16) returns to a normal speed.

In the above-mentioned conveying and stacking system for corrugated cardboard system, upon order change it is necessary to separate new and old corrugated cardboard sheets from each other. In the following, description will be made on this point. In a manufacturing process, a new corrugated cardboard web fed after the set values at various portions were changed is transformed into new corrugated cardboard sheets (1a) through a cutting step similarly to the old corrugated cardboard web, the same corrugated cardboard sheets enter the feed roll (3) section via the conveyor on the outlet side of the cut-off, where the sheets are pinched by cooperation between the feed roll (3) and the press roll (14), then they are forcibly ejected onto the first conveyor (15) and subjected to shingling on the old corrugated cardboard sheets (1b) (see Fig. 4 (II)). These new corrugated cardboard sheets (1a) are detected by well-known means at the feed roll (3) section, and as shown in Fig. 4(II) they are separated from the old corrugated cardboard sheets (1b) by the stopper (18) being actuated upwards in synchronism with the

timing of transfer from the first conveyor (15) to the second conveyor (16).

In the above-described conveying and stacking apparatus for corrugated cardboard sheets in the prior art, while provision is made such that the old corrugated cardboard sheets (1b) subjected to shingling and the new corrugated cardboard sheets (1a) likewise subjected to shingling are separated from each other by raising the stopper (18) provided between the first conveyor (15) and the second conveyor (16) as shown in Figs. 4(I) and 4(II), the new and old corrugated cardboard sheets (1a) and (1b) cannot be surely separated from each other only by raising the stopper (18), but the old corrugated cardboard sheet (1b) in the rearmost position may possibly mix in the new corrugated cardboard sheets (1a) in the foremost portion as shown in Fig. 5(I), or the new corrugated cardboard sheet (1a) in the foremost position may possibly mix in the old corrugated cardboard sheets (1b) in the rearmost portion as shown in Fig. 5(II), hence an assorting work for removing this mixed corrugated cardboard sheet in the next step is necessitated, and this lowered a working efficiency and became an obstacle in automation and energy saving of production.

SUMMARY OF THE INVENTION:

It is therefore one object of the present invention to provide a conveying and stacking apparatus for sheet bodies which can dispense with an assorting work for mixed sheet bodies which was necessitated in the next step of the process in the prior art.

According to one feature of the present invention, ther is provided a novel conveying and stacking apparatus for sheet bodies having a conveying device for continuously conveying sheet bodies and a stacking table on which sheet bodies ejected from an end of the conveying device on the downstream side in the conveying direction are stacked, the sheet bodies being separated at every predetermined number of sheets and then conveyed and stacked, which apparatus includes at least one suction pad disposed at an inlet portion of the conveying device and adapted to selectively suck and stop the sheet body, and a plate disposed on the downstream side of the suction pad so as to be projected into and retracted from a conveying route of the sheet bodies.

Since the conveying and stacking apparatus according to the present invention is constructed as described above, when the foremost one of the new sheet bodies has been fed as shingled on the rearmost one of the old sheet bodies, the suction pad or pads are actuated to suck the foremost one of the new sheet bodies, and thereby the foremost one of the new sheet bodies can be separated from the rearmost one of the old sheet bodies.

In addition, the plate disposed on the downstream side of the suction pad projects into the conveying route to stop the succeeding sheet bodies when the old sheet bodies have passed over the plate and thereby assures separation between the foremost one of the new sheet bodies and the rearmost one of the old sheet bodies.

The above-mentioned and other objects, features and advantages of the present invention will become more apparent by reference to the following description of one preferred embodiment of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings:

Fig. 1 is a schematic side view showing one preferred embodiment of the conveying and stacking apparatus for sheet bodies according to the present invention;

Fig. 2(I) is a system diagram showing a suction system for the respective suction pads;

Fig. 2(II) is a schematic plan view showing an arrangement of the respective suction pads;

Fig. 2(III) is a partial side view illustrating a suction effect of the suction pad;

Fig. 3 is a schematic side view showing an operation of a separating bar;

Fig. 4(I) is a schematic side view showing a conveying and stacking apparatus for sheet bodies in the prior art;

Fig. 4(II) is a partial side view of the same apparatus in the prior art showing a separating effect of a stopper provided in the system; and

Figs. 5(I) and 5(II) are schematic views illustrating a problem involved in the stopper in the known system.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

Now one preferred embodiment of the conveying and stacking system for sheet bodies according to the present invention will be described in greater detail with reference to Figs. 1 to 3. In these figures, reference numeral (1) designates corrugated cardboard sheets, numeral (1a) designates new corrugated cardboard sheets, numeral (1b) designates old cardboard sheets, numeral (2) designates a stacking table, numeral (3) designates a feed roll, numeral (4) designates a sucking device,

numeral (5) designates a bracket for the same sucking device (4) and this bracket (5) is adapted to be raised and lowered in the direction of arrows in Fig. 2(I). Reference numeral (6) designates suction pads in the same suction device (4), which are mounted to the bracket (5) in a vertically movable manner, and these suction pads (6) are provided in multiple as arrayed in the widthwise direction of the corrugated cardboard sheets (1), that is, in the direction perpendicular to the conveying direction of the corrugated cardboard sheets (1). Reference numeral (19) designates spring for biasing the respective suction pads (6) upwards to hold them at a predetermined height, so that when the bracket (5) has been raised, the top surfaces of the respective suction pads (6) are raised up to a level slightly higher than a conveying surface (12) of the first conveyor (15). In addition, reference numerals (7), (7′) and (7″) respectively designate connecting piped extending from the respective suction pads (6), numerals (8), (8′) and (8″) respectively designate strainers provided in the connecting pipes (7), (7′) and (7″), numerals (9), (9′) and (9″) respectively designate electromagnetic valves provided in the connecting pipes (7), (7′) and (7″) respectively, numeral (10) designates a surge tank, numeral (11) designates a vacuum pump, numeral (9‴) designates another electromagnetic valve provided in a connecting pipe that communicates the vacuum pump (11) with the above-mentioned surge tank (10), and provision is made such that a corrugated cardboard sheet (1) being conveyed towards the first conveyor (15) may be sucked by sucking the air within the respective suction pads (6) through the route of the connecting pipes (7), (7′) and (7″) → the strainers (8), (8′) and (8″) → the electromagnetic valves (9), (9′) and (9″) → the surge tank (10) by means of the vacuum pump (10). In addition, reference numeral (13) designates a separating bar disposed at an end of the second conveyor (16) on the downstream side in the conveying direction, numeral (14) designates a press roll, and numeral (17) designates a limit switch.

Next, description will be made on the operation of the conveying and stacking system for sheet bodies illustrated in Figs. 1 to 3. In a manufacturing process, a new corrugated cardboard web that is fed after the set valued at various portions have been changed, is transformed into new corrugated cardboard sheets (1a) via a cutting step similarly to the old corrugated cardboard web, then these corrugated cardboard sheets (1a) enter the feed roll (3) section through a conveyor on the outlet side of the cut-off, in this section they are forcibly ejected onto the first conveyor (15) as pinched by cooperation of the feed roll (3) and the press roll (14), and then they are subjected to shingling and placed on the old corrugated cardboard sheets (1b). At this moment, the bracket (5) is raised, hence the respective suction pads (6) would rise from their standby position about 2 - 3 mm lower than the conveying plane (12) of the first conveyor (15) to their sucking position about 10 mm higher than the same conveying plane (12), and the foremost one of the new corrugated cardboard sheets (1a) is sucked by the respective suction pads (6) (See Fig. 2(III)). At this moment, among a plurality of suction pads (6) arrayed in the widthwise direction of the corrugated cardboard sheet, only the suction pads (6) positioned within a certain range that is smaller than the maximum sheet width according to the width of the sheet to be sucked, are operated by selective actuation of the electromagnetic valves (9), (9′) and (9″), and therefore, it would never occur that the vacuum pressure in the surge tank (10) is degraded by inflow of the atmospheric air through the suction pads not engaged with the corrugated cardboard sheet (1) nor the vacuum pump consumes extra wasteful electric power due to such inflow of the atmospheric air. On the other hand, the old corrugated cardboard sheets (1b) are conveyed towards the stacking table (2) by the first and second conveyors (15) and (16) which are then driven at a high speed. After lapse of a predetermined period, when a predetermined gap space has been established between the old corrugated cardboard sheets (1b) and the new corrugated cardboard sheets (1a), the respective suction pads (6) sucking the above-described new corrugated cardboard sheet (1a) releases the suction effect for the new corrugated cardboard sheet (1a), and thereby the new corrugated cardboard sheet (1a) is ejected onto the first conveyor (15). Furthermore, when the ejection of the old corrugated cardboard sheets (1b) has been completed, a signal issued at that time is sent to the separating bar (13), hence the separating bar (13) is raised, the new corrugated cardboard sheets (1a) being conveyed towards the stacking table (2) on the second conveyor (16) are stopped by this separating bar (13), and thereby the new corrugated cardboard sheets (1a) can be separated from the old corrugated cardboard sheets (1b) (See Fig. 3).

As will be obvious from the above description, in the conveying and stacking apparatus for sheet bodies according to the present invention, when the foremost one of new sheet bodies has been fed as shingled onto the rearmost one of old sheet bodies, the respective suction pads are operated to such the foremost one of the new sheet bodies, thereby the foremost one of the new sheet bodies is separated from the rearmost one of the old sheet bodies, and furthermore, the foremost portion of the new sheet bodies is stopped by the plate disposed on the downstream side of the suction pads, so that the new sheet bodies and the old

sheet bodies can be surely separated from each other. Therefore, and advantage is obtained that an assorting work for mixed sheet bodies which was necessitated in the next step of the process in the prior art can be dispensed with.

While a principle of the present invention has been described above in connection to one preferred embodiment of the invention, it is a matter of course that many apparently widely different embodiments of the present invention could be made without departing from the spirit of the present invention

Claims

1. A conveying and stacking apparatus for sheet bodies including a conveying device for continuously conveying sheet bodies and a stacking table on which sheet bodies ejected from an end of said conveying device on the downstream side in the conveying direction are stacked, said sheet bodies being separated at every predetermined number of sheets and then conveyed and stacked; characterized in that said apparatus includes at least one suction pad disposed at an inlet portion of said conveying device and adapted to selectively suck and stop the sheet body, and a plate disposed on the downstream side of said suction pad so as to be projected into and retracted from a conveying route of said sheet bodies.

2. A conveying and stacking apparatus for sheet bodies as claimed in Claim 1, characterized in that said suction pads are provided in multiple along a widthwise direction of said sheet body, and a range of suction is controlled depending upon a sheet width.

3. A conmveying and stacking apparatus for sheet bodies as claimed in Claim 1, characterized said suction pad or pads are integrally supported from a bracket via a spring or springs, and said bracket is moved vertical towards or from the sheet body to suck or release the latter.

Fig. 1

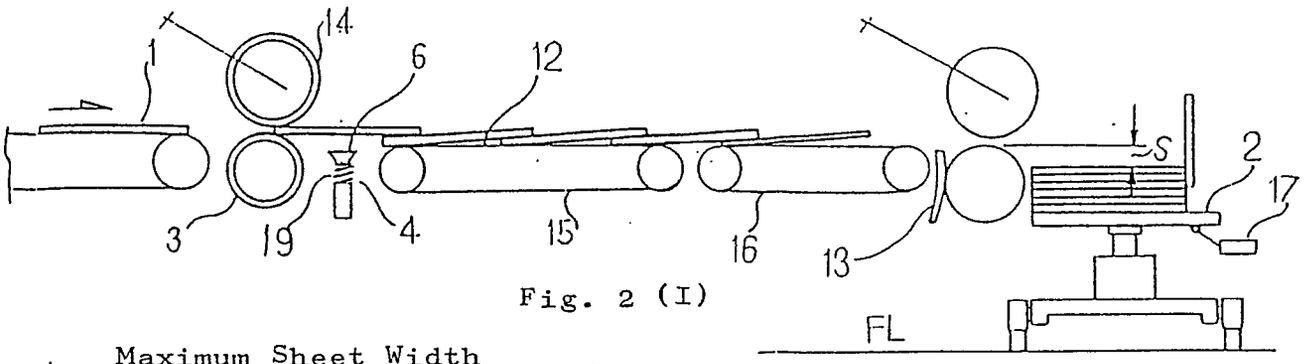


Fig. 2 (I)

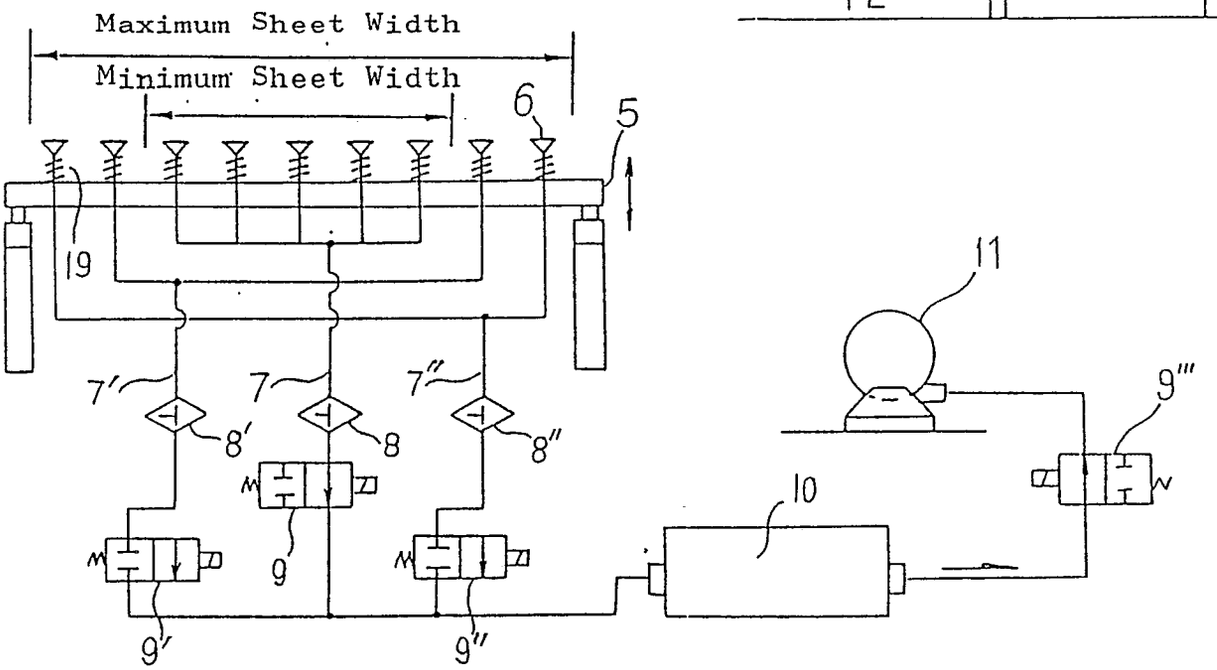


Fig. 2 (II)

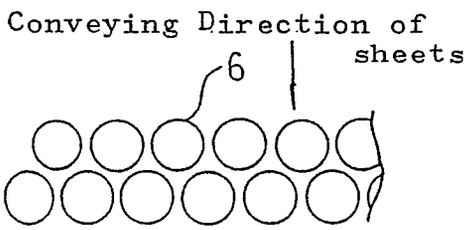


Fig. 2 (III)

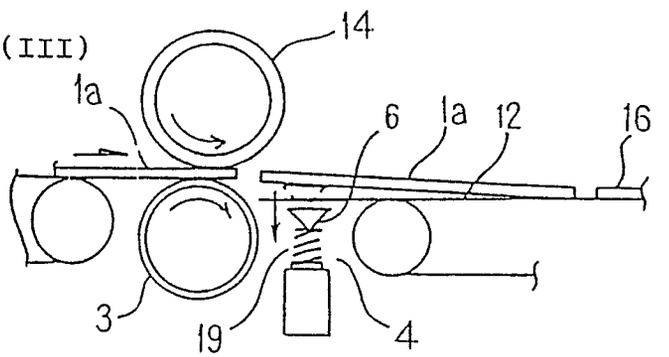


Fig. 3

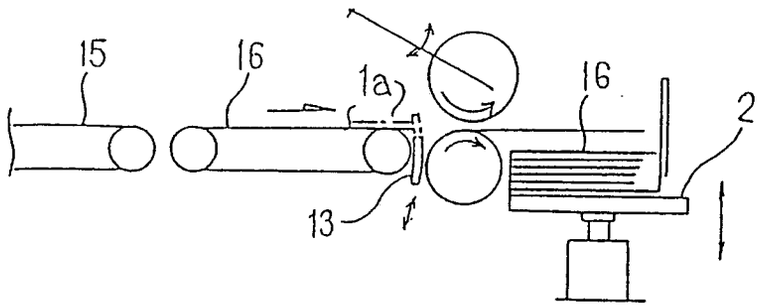


Fig. 4 (I)

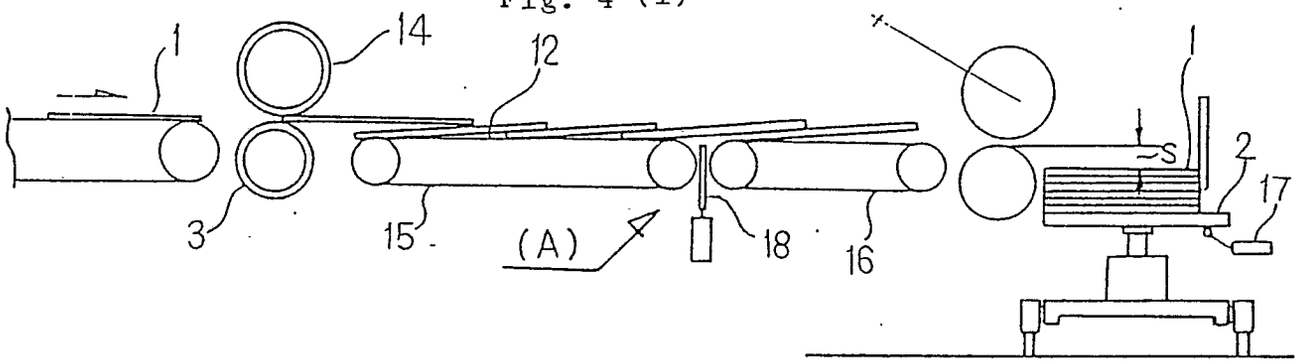


Fig. 4 (II)

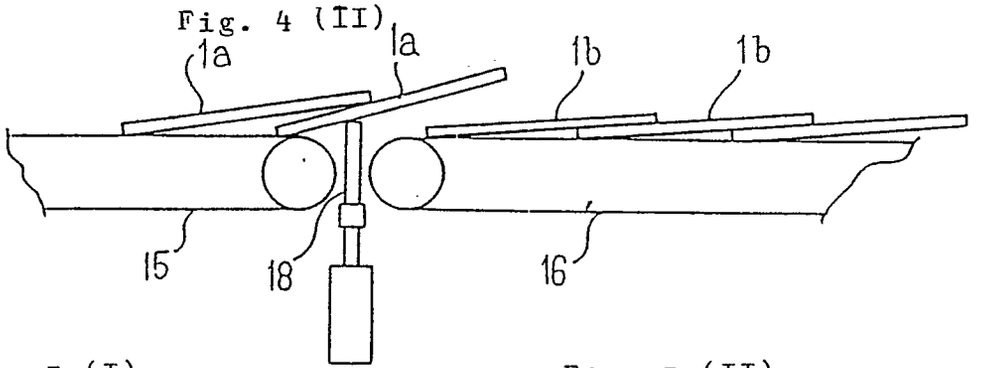


Fig. 5 (I)

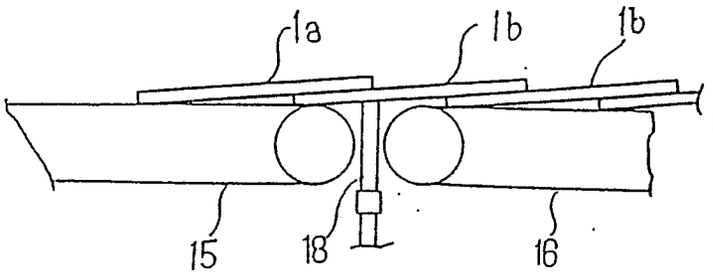
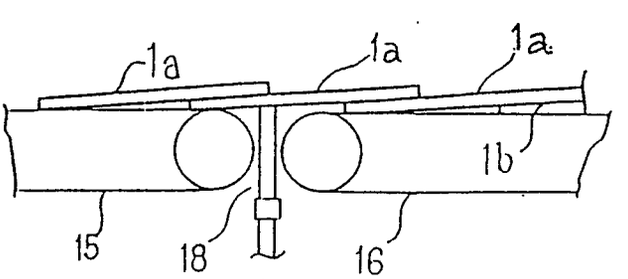


Fig. 5 (II)



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EUROPEAN SEARCH REPORT

Application Number

EP 88 10 2386

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)
Y	GB-A-2 182 645 (BOBST) * Whole document * ---	1	B 65 H 29/00 B 65 H 29/66
Y	DE-B-1 245 702 (JAGENBERG) * Whole document * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-09-1988	EVANS A.J.

CATEGORY OF CITED DOCUMENTS

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