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(54) **Paper sheet material receiving and stacking system**

(57) A paper sheet material receiving and stacking system includes a conveying unit including a feed table for receiving pieces of paper sheet material cut out of a continuous web, a receiving and adjustment unit including a carrier frame pivotally connected to the conveyor unit for transferring the received pieces of paper sheet material and a driving device for biasing the carrier frame between a horizontal position and an inclined position

and an adjustment mechanism for controlling the gap of a sheet-transfer passage, and a stacking unit including a platform adapted for receiving pieces of paper sheet material passing through the sheet-transfer passage and a transmission mechanism controllable to move the platform horizontally forward, backward, leftward and rightward and vertically up and down and a sliding limiter for stopping pieces of paper sheet material on the platform in a stack.

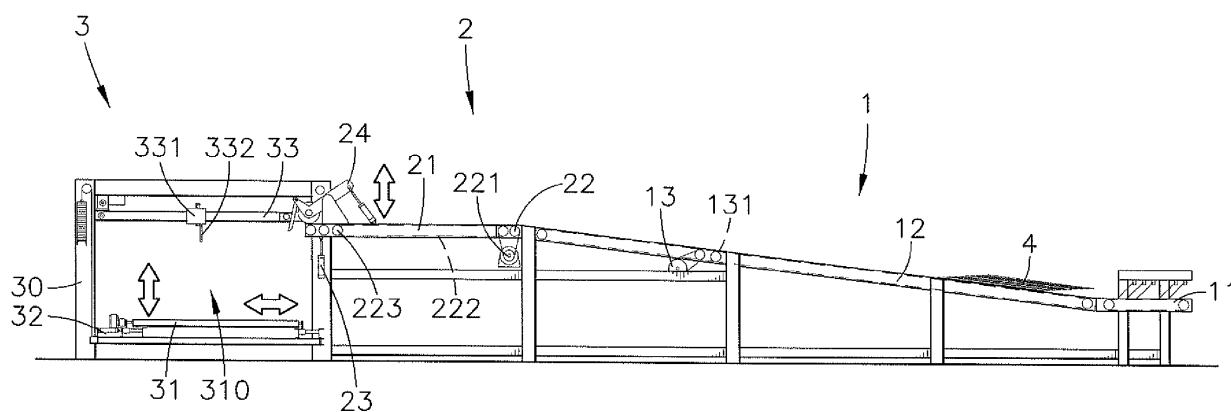


FIG. 1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates to a machine for receiving and stacking pieces of sheet material, for example, cardboard or corrugated sheets of different thickness and more particularly, to a paper sheet material receiving and stacking system, which can automatically stack up pieces of paper sheet material for quick packing, saving much labor and time and lowering the stacking and packing cost.

2. Description of the Related Art:

[0002] In our daily life, many different sheets of paper material, such as writing paper, packing paper, office paper and etc., may be used for the purpose of writing, or for packing or protecting articles. For example, corrugated sheets are commonly used for making cartons for holding things. Corrugated sheets are generally made of a central fluted or corrugated core layer bonded to outer, opposed face sheets, with the use of a starch base paste. The board is passed over a series of heated plates to cause the starch to gel and harden, completing the bond. After bonding of the plies, the continuous web of corrugated paperboard product is trimmed and cut off into pieces. The pieces of paper sheet material thus obtained can be further processed into cartons or other forms for different applications. When a continuous web of corrugated paperboard product is cut off into pieces, the pieces of paper sheet material **A** may be delivered through a paper sheet material conveyor system, which, as shown in FIG. 8, comprises a sheet-transfer conveying belt unit **B** and a stack conveying belt unit **C**. When a predetermined number of pieces of paper sheet material **A** (10pcs, 15pcs or 20pcs of paper sheet material) is stacked up, the stack of pieces of paper sheet material is then delivered by the stack conveying belt unit **C** to a predetermined location for further packing and/or delivery. The use of the paper sheet material conveyor system is still not satisfactory in function due to the following problems:

1. After transfer of pieces of paper sheet material **A** by the sheet-transfer conveying belt unit **B** to the stack conveying belt unit **C**, workers must manually arrange the pieces of paper sheet material **A** neatly in a stack, wasting much labor. Further, it is inconvenient to wrap the stack of pieces of paper sheet material **A** at the stack conveying belt unit **C**.
2. The conveying speed of the sheet-transfer conveying belt unit **B** and the conveying speed of the stack conveying belt unit **C** are limited so that workers can arrange the pieces of paper sheet material **A** neatly in a stack and wrap the stack of pieces of

paper sheet material **A** at the stack conveying belt unit **C**. In consequence, the operating speed is lowered, resulting in low efficiency.

3. As the operating speed of the paper sheet material conveyor system is limited, much energy will be wasted, and the cost will be relatively increased.

SUMMARY OF THE INVENTION

[0003] The present invention has been accomplished under the circumstances in view. It is therefore an object of the present invention to provide a paper sheet material receiving and stacking system, which can automatically stack up pieces of paper sheet material for quick packing, saving much labor and time and lowering the stacking and packing cost.

[0004] To achieve this and other objects of the present invention, a paper sheet material receiving and stacking system comprises a conveying unit, a receiving and adjustment unit, and a stacking unit. The conveying unit comprises a feed table for receiving pieces of paper sheet material cut out of a continuous web. The receiving and adjustment unit comprises a carrier frame pivotally connected to the conveyor unit for transferring pieces of paper sheet material from the conveying unit to the stacking unit, and adjustment mechanism for controlling the gap of a sheet-transfer passage through which pieces of paper sheet material are delivered individually to the stacking unit. The stacking unit comprises a platform adapted for receiving pieces of paper sheet material from the sheet-transfer passage, and a sliding limiter for stopping pieces of paper sheet material on the platform in a stack.

[0005] Further, the conveying unit comprises a conveyor frame extends obliquely upwardly from the feed table, an endless conveying belt mounted on the conveyor frame, and a motor drive mounted at the conveyor frame and controllable to rotate the endless conveying belt on the conveyor frame in delivering pieces of paper sheet material from the feed table to the receiving and adjustment unit. The motor drive of the conveying unit is controllable to change the speed. The receiving and adjustment unit further comprises a driving device adapted for biasing the carrier frame between a horizontal position and an inclined position.

[0006] Further, the stacking unit comprises a transmission mechanism controllable to move the platform horizontally forward, backward, leftward and rightward and vertically up and down.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a schematic side view of a paper sheet material receiving and stacking system in accordance with the present invention.

FIG. 2 is an enlarged view of a part of the paper sheet material receiving and stacking system in accord-

ance with the present invention.

FIG. 3 is a schematic side view of the present invention, illustrating the operation of the paper sheet material receiving and stacking system (I).

FIG. 4 is a schematic side view of the present invention, illustrating the operation of the paper sheet material receiving and stacking system (II).

FIG. 5 is a schematic side view of the present invention, illustrating the operation of the paper sheet material receiving and stacking system (III).

FIG. 6 is a schematic side view of the present invention, illustrating the operation of the paper sheet material receiving and stacking system (IV).

FIG. 7 is a schematic side view of the present invention, illustrating the operation of the paper sheet material receiving and stacking system (V).

FIG. 8 illustrates a paper sheet material conveyor system according to the prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0008] Referring to FIGS. 1 and 2, a paper sheet material receiving and stacking system in accordance with the present invention comprises a conveying unit **1**, a receiving and adjustment unit **2**, and a stacking unit **3**.

[0009] The conveying unit **1** comprises a feed table **11**, a conveyor frame **12** obliquely upwardly extended from one end of the feed table **11** toward a predetermined direction, an endless conveying belt **131** mounted on the conveyor frame **12**, and a motor drive **13** mounted at the conveyor frame **12** and controllable to rotate the endless conveying belt **131** on the conveyor frame **12**.

[0010] The receiving and adjustment unit **2** comprises a carrier frame **21** pivotally connected to one end (high end) of the conveyor frame **12** opposite to the feed table **11**, transmission rollers **22** pivotally mounted at one end of the carrier frame **21** adjacent to the conveyor frame **12**, steering rollers **223** pivotally mounted at an opposite end of the carrier frame **21**, an endless conveying belt **222** mounted on the transmission rollers **22** and the steering rollers **223**, a motor drive **221** mounted in the bottom side of the carrier frame **21** and controllable to rotate the transmission rollers **22** in moving the endless conveying belt **222**, a driving device **23** coupled to the other end of the carrier frame **21** adjacent to the steering rollers **223** and controllable to lift the other end of the carrier frame **21**, and an adjustment mechanism **24** mounted the top side of the other end of the carrier frame **21** above the driving device **23**. The adjustment mechanism **24** comprises a bracket **241** fixedly mounted at the carrier frame **21**, a substantially L-shaped link **242** pivotally mounted at the bracket **241**, a push and pull member **243** coupled between the carrier frame **21** and one end of the L-shaped link **242**, an impression wheel **244** pivotally mounted at the angled corner area of the L-shaped link **242** and defining with the surface of the endless conveying belt **222** a sheet-transfer passage **25**, and a stop bar

245 coupled to the other end of the L-shaped link **242**. The push and pull member **243** is controllable to bias the L-shaped link **242** relative to the bracket **241**, thereby adjusting the gap of the sheet-transfer passage **25**.

[0011] The stacking unit **3** comprises a frame base **30** connected to the receiving and adjustment unit **2** adjacent to the other end of the carrier frame **21** opposite to the conveyor frame **1**, a platform **31** suspending in the frame base **30**, a sliding track **33** mounted in the frame base **30** above the platform **31**, a stacking space **310** defined in the frame base **30** between the platform **31** and the sliding track **33**, a transmission mechanism **32** mounted in the frame base **30** and controllable to move the platform **31** horizontally forward, backward, leftward and rightward, and vertically up and down, and a sliding limiter **331** mounted on and movable along the sliding track **33** and holding a stop member **332** in the stacking space **310**.

[0012] During installation, the carrier frame **21** of the receiving and adjustment unit **2** is pivotally connected to the high end of the conveyor frame **12** of the conveying unit **1** opposite to the feed table **11**, and then the frame base **30** of the stacking unit **3** is connected to the receiving and adjustment unit **2** adjacent to the other end of the carrier frame **21** opposite to the conveyor frame **12**, enabling the stop bar **245** of the adjustment mechanism **24** to suspend in the stacking space **310** of the stacking unit **3**. Thus, the paper sheet material receiving and stacking system is set up for stacking pieces of paper sheet material **4**, for example, corrugated sheets or cardboard sheets.

[0013] The conveying unit **1** is adapted for receiving paper sheet material, for example, corrugated sheets or cardboard sheets, by means of the feed table **11**. The driving device **23** and push and pull member **243** of the receiving and adjustment unit **2** can be hydraulic cylinders, pneumatic cylinders, transmission gear sets, transmission chains, motor sets, or any of a variety of other transmission means capable of biasing the L-shaped link **242** back and forth relative to the bracket **241**. The transmission mechanism **32** of the stacking unit **3** can be hydraulic cylinders, pneumatic cylinders, transmission gear sets, transmission chains, motor sets, or any of a variety of other transmission means.

[0014] Further, the motor drive **13** of the conveying unit **1** is controllable to change its speed of rotation, thereby controlling the conveying speed of the endless conveying belt **131** at the conveyor frame **12**. The motor drive **221** of the receiving and adjustment unit **2** is controllable to change its speed of rotation, thereby controlling the conveying speed of the endless conveying belt **222** at the carrier frame **21**.

[0015] Referring to FIG. 3 and FIGS. 1 and 2 again, pieces of paper sheet material **4**, for example, corrugated sheets or cardboard sheets, cut out of a continuous web, are fed through the feed table **11** of the conveying unit **1** into the endless conveying belt **131** at the conveyor frame **12** that is rotated by the motor drive **13** at a predetermined

speed. The speed of the endless conveying belt **131** is controlled subject to the actual job site operating requirements (for example, for stacking 10pcs, 15pcs or 20pcs of paper sheet material **4** within a predetermined time period). After feeding of a predetermined number of pieces of paper sheet material **4** into the endless conveying belt **131** by the feed table **11**, the motor drive **13** is controlled to accelerate the speed, driving the endless conveying belt **131** to deliver the overlapped pieces of paper sheet material **4** to the carrier frame **21** of the receiving and adjustment unit **2**. At the same time, the driving device **23** is controlled to lower the other end of the carrier frame **21** from a horizontal position to an inclined position, and then the motor drive **221** is controlled to rotate the transmission rollers **22**, moving the endless conveying belt **222** to deliver the pieces of paper sheet material **4** to the adjustment mechanism **24**. At this time, the sheet-transfer passage **25** between the impression wheel **244** and the surface of the endless conveying belt **222** is adjusted for allowing the pieces of paper sheet material **4** to pass individually. Thus, the pieces of paper sheet material **4** are transferred to the platform **31** of the stacking unit **3** one after another and stacked on one another at the platform **31** in the stacking space **310**. By means of the operation of the stop bar **245** of the adjustment mechanism **24** and the stop member **332** of the stacking unit **3** to stop the stacked pieces of paper sheet material **4** at the platform **31** of the stacking unit **3**, the stacked pieces of paper sheet material **4** is kept neatly in a stack. During stacking, the transmission mechanism **32** is controlled to lower the platform **31**, enabling a predetermined number of pieces of paper sheet material **4** to be stacked up at the platform **31**.

[0016] Referring to FIGS. 4, 5, 6 and 7, and FIG. 1 again, after a predetermined number of pieces of paper sheet material **4** have been delivered out of the adjustment mechanism **24** of the receiving and adjustment unit **2** to the platform **31** of the stacking unit **3** during the stacking operation, the driving device **23** is controlled to lift the other end of the carrier frame **21** from the inclined position for enabling the endless conveying belt **222** to receive another predetermined number of pieces of paper sheet material **4** from the endless conveying belt **131** of the conveying unit **1** to run a next stacking cycle.

[0017] When the endless conveying belt **222** at the carrier frame **21** receives another set of overlapped pieces of paper sheet material **4** from the endless conveying belt **131**, the driving device **23** is controlled to lower the other end of the carrier frame **21** from the horizontal position to the inclined position again, and then the motor drive **221** is controlled to rotate the transmission rollers **22**, moving the endless conveying belt **222** to deliver the overlapped pieces of paper sheet material **4** to the adjustment mechanism **24**, and at the same time, the transmission mechanism **32** of the stacking unit **3** is controlled to move the platform **31** horizontally relative to the frame base **30**, leaving a predetermined distance **D** between one end edge of the duly stacked pieces of paper sheet

material **4** and the stop member **332** of the stacking unit **3**, enabling the next set of pieces of paper sheet material **4** to be stacked up on the previous stack of pieces of paper sheet material **4** at the platform **31** in an offset manner, facilitating further wrapping or packing operation without causing interference and saving much labor and packing time. Thus, the invention can automatically stack up pieces of paper sheet material for quick packing, lowering the stacking and packing cost and avoiding wasting resources.

[0018] As stated above, the invention provides a paper sheet material receiving and stacking system, which utilizes the feed table **11** of the conveying unit **1** to receive pieces of paper sheet material **4** that are cut out of a continuous web, the endless conveying belt **131** at the conveyer frame **12** of the conveying unit **1** to deliver the received pieces of paper sheet material **4** to the carrier frame **21** of the receiving and adjustment unit **2** for enabling the endless conveying belt **222** at the carrier frame **21** to deliver the received pieces of paper sheet material **4** to the platform **31** of the stacking unit **3**, and the stop bar **245** of the adjustment mechanism **24** and the stop member **332** of the stacking unit **3** to stop the stacked pieces of paper sheet material **4** neatly at the platform **31** of the stacking unit **3**. Thus, the paper sheet material receiving and stacking system can automatically stack up pieces of paper sheet material for quick packing, saving much labor and time and lowering the stacking and packing cost.

[0019] In conclusion, the invention provides a paper sheet material receiving and stacking system, which has the advantages and features as follows:

1. By means of the feed table **11** of the conveying unit **1** to receives piece of paper sheet material **4** that are cut out of a continuous web, the endless conveying belt **131** of the conveying unit **1** to deliver the received pieces of paper sheet material **4** to the receiving and adjustment unit **2**, the endless conveying belt **222** of the receiving and adjustment unit **21** to deliver the received pieces of paper sheet material **4** from the conveying unit **1** to the platform **31** of the stacking unit **3** and the adjustment mechanism **24** to adjust the gap of the sheet-transfer passage **25** subject to the thickness of the pieces of paper sheet material **4**, the paper sheet material receiving and stacking system can automatically stack up pieces of paper sheet material for quick packing, saving much labor and time and lowering the stacking and packing cost.

2. The transmission mechanism **32** of the stacking unit **3** is controllable to move the platform **31** horizontally and vertically relative to the frame base **30**, different sets of pieces of paper sheet material **4** to be stacked up on one another in an offset manner, facilitating further wrapping or packing operation without causing interference.

3. By means of the conveying unit **1**, the receiving

and adjustment unit 2 and the stacking unit 3, the paper sheet material receiving and stacking system automatically stacks up pieces of paper sheet material neatly for quick packing, saving much stacking and packing time and cost and avoiding wasting resources.

[0020] Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention.

Claims

1. A paper sheet material (4) receiving and stacking system, comprising:

a conveying unit (1), said conveying unit (1) comprising a feed table(11) for receiving pieces of paper sheet material (4) cut out of a continuous web, a conveyor frame(12) extended from one end of said feed table(11) and an endless conveying belt (131) mounted on said conveyor frame and adapted for delivering the pieces of paper sheet material (4) received by said feed table(11) to a receiving and adjustment unit (2); a receiving and adjustment unit (2), said receiving and adjustment unit (2) comprising a carrier frame (21) pivotally connected to one end of said conveyor frame(12) opposite to said feed table (11) and adapted for transferring the received pieces of paper sheet material (4) from the endless conveying belt (131) of said conveying unit (1) to a stacking unit (3), a driving device (23) coupled to an opposite end of said carrier frame (21) and controllable to move said carrier frame (21) between a horizontal position and an inclined position, an adjustment mechanism (24) at said carrier frame (21) and adapted for controlling said conveyor frame(12) to transfer the received pieces of paper sheet material (4) to a stacking unit (3) piece by piece; and a stacking unit (3) adapted for receiving pieces of paper sheet material (4) from said receiving and adjustment unit (2) and stacking up the received pieces of paper sheet material (4) in a stack, said stacking unit (3) comprising a platform (31) adapted for receiving pieces of paper sheet material (4) from said receiving and adjustment unit(2), a transmission mechanism(32) controllable to move said platform (31) horizontally forward, backward, leftward and rightward and vertically up and down, a stacking space (310) defined above said platform (31) and a sliding limiter (331) suspending in said stacking space (310) and adapted for stopping pieces of

paper sheet material (4) in said stacking space (310) in a stack.

2. The paper sheet material(4) receiving and stacking system as claimed in claim 1, wherein the pieces of paper sheet material (4) receivable by said feed table (11) are corrugated sheets or cardboard sheets.
3. The paper sheet material(4) receiving and stacking system as claimed in claim 1, wherein said conveyor frame(12) extends obliquely upwardly from said feed table(11); said conveying unit (1) further comprises a motor driver (13) mounted at said conveyor frame (12) and controllable to rotate the endless conveying belt (131) of said conveying unit (1) on said conveyor frame(12) at different speeds.
4. The paper sheet material(4) receiving and stacking system as claimed in claim 1, wherein said receiving and adjustment unit (2) comprises at least one transmission roller (22) pivotally mounted at one end of said carrier frame (21) adjacent to the conveyor frame(12) of said conveying unit (1), at least one steering roller (223) pivotally mounted at an opposite end of said carrier frame (21), an endless conveying belt (222) mounted on said at least one transmission roller (22) and said at least one steering roller (223), a motor driver (221) mounted in a bottom side of said carrier frame (21) and controllable to rotate said at least one transmission roller (22) in moving the endless conveying belt (222) of said receiving and adjustment unit(2); said driving device (23) is selected from the group of hydraulic cylinder, pneumatic cylinder, transmission gear set, transmission chain and motor set.
5. The paper sheet material(4) receiving and stacking system as claimed in claim 1, wherein said adjustment mechanism (24) comprises a bracket fixedly mounted at said carrier frame(21), a substantially L-shaped link pivotally mounted at said bracket, a push and pull member coupled between said carrier frame (21) and one end of said L-shaped link and adapted for biasing said L-shaped link, an impression wheel pivotally mounted at an angled corner area of said L-shaped link and defining with the endless conveying belt(222) of said receiving and adjustment unit (2) a sheet-transfer passage through which pieces of paper sheet material (4) are delivered individually.
6. The paper sheet material(4) receiving and stacking system as claimed in claim 5, wherein said push and pull member of said receiving and adjustment mechanism(24) is selected from the group of hydraulic cylinder, pneumatic cylinder, transmission gear set, transmission chain and motor set.
7. The paper sheet material(4) receiving and stacking

system as claimed in claim 1, wherein said transmission mechanism(32) of said stacking unit(3) comprises at least one of the sets of hydraulic cylinders, pneumatic cylinders, transmission gear sets, transmission chains and motor sets.

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8. The paper sheet material(4) receiving and stacking system as claimed in claim 1, wherein said stacking unit (3) further comprises a sliding track(33) suspending above said stacking space (310); said sliding limiter (331) is slidably mounted at said sliding track(33) and holding a stop member(332) in said stacking space (310) for stopping pieces of paper sheet material(4) at said platform (31) in a stack.

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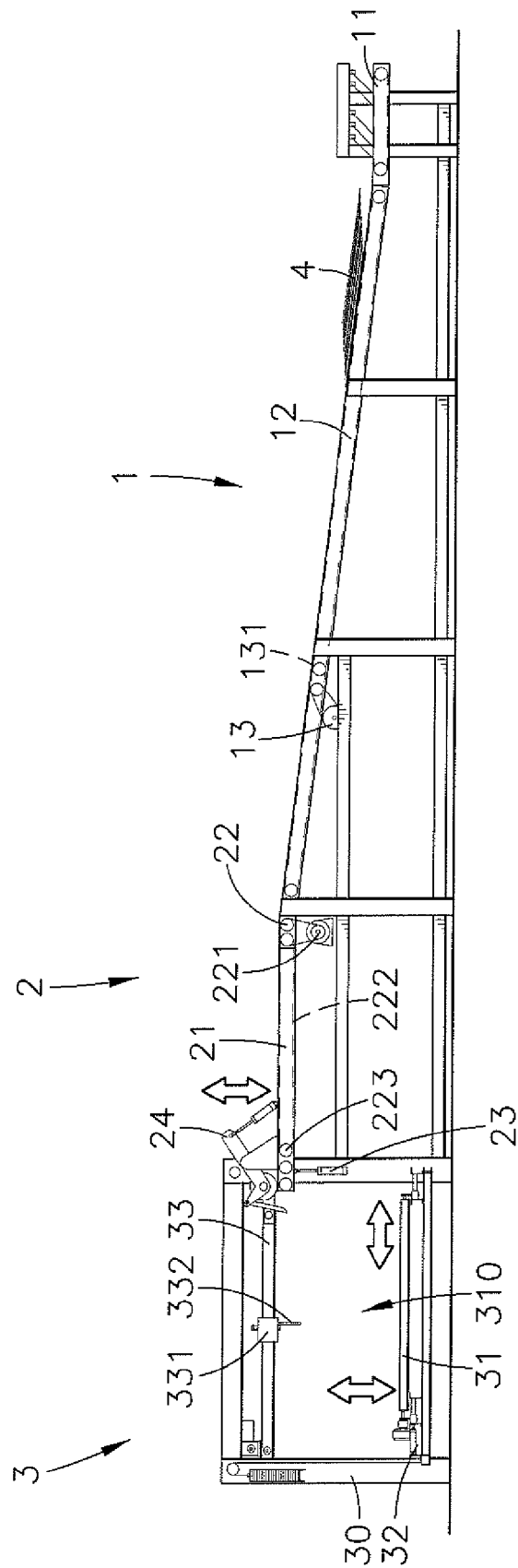


FIG. 1

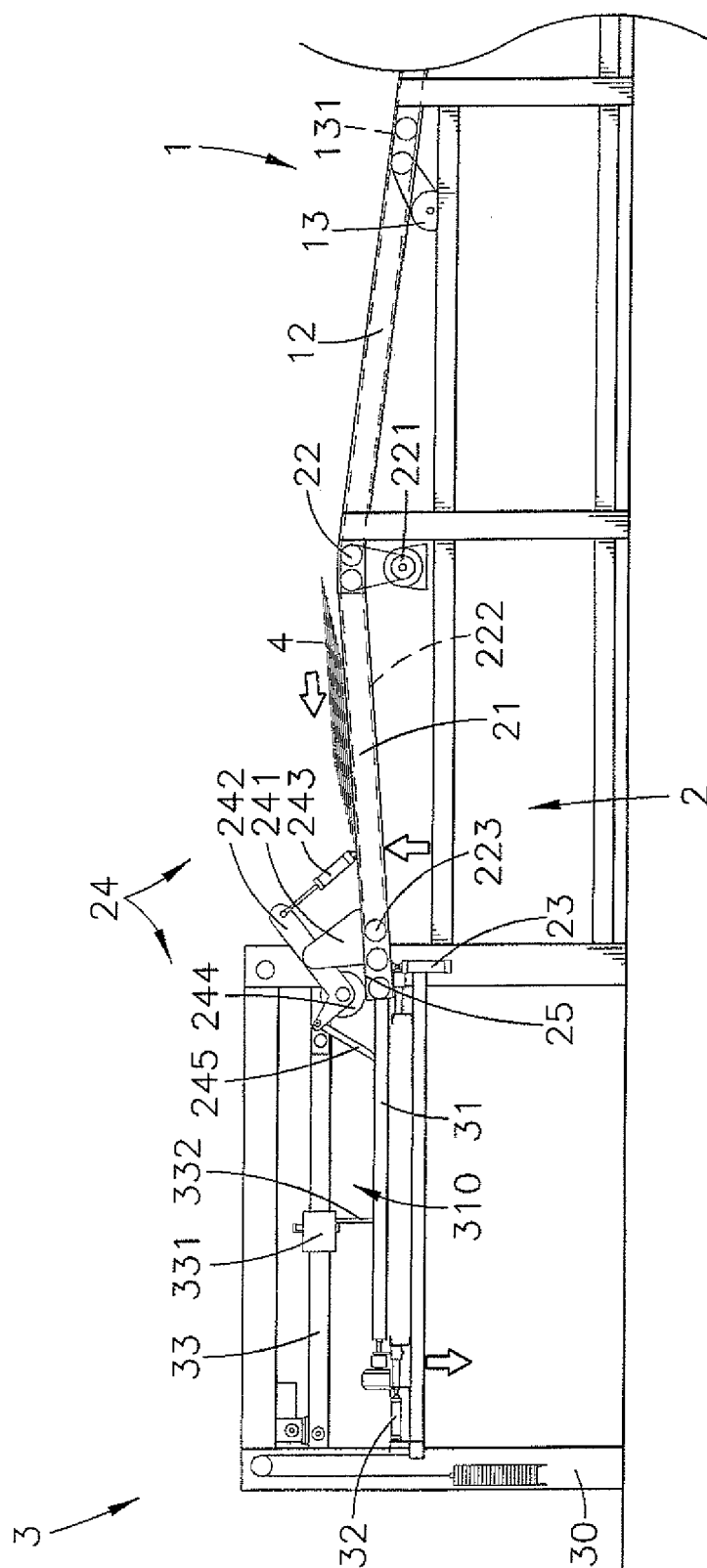


FIG. 2

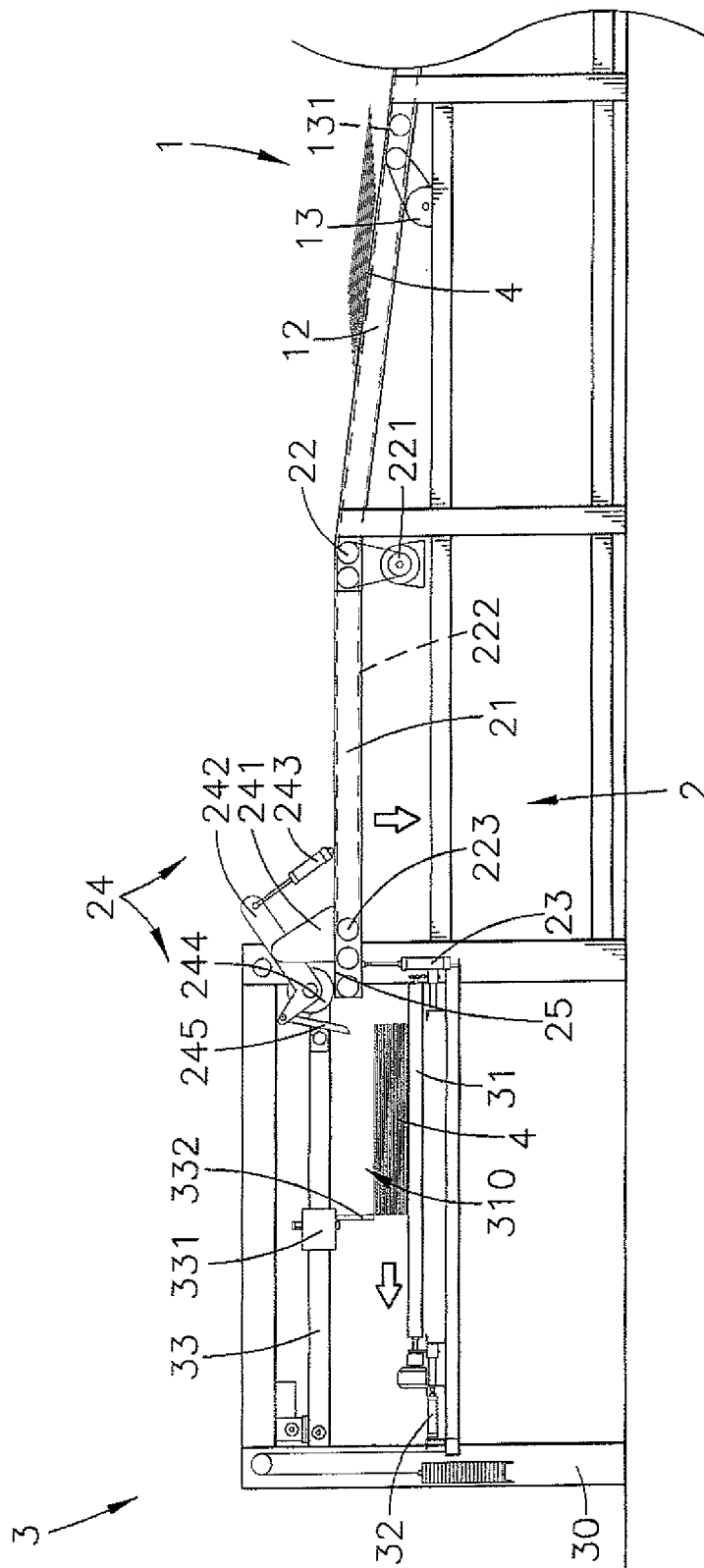


FIG. 3

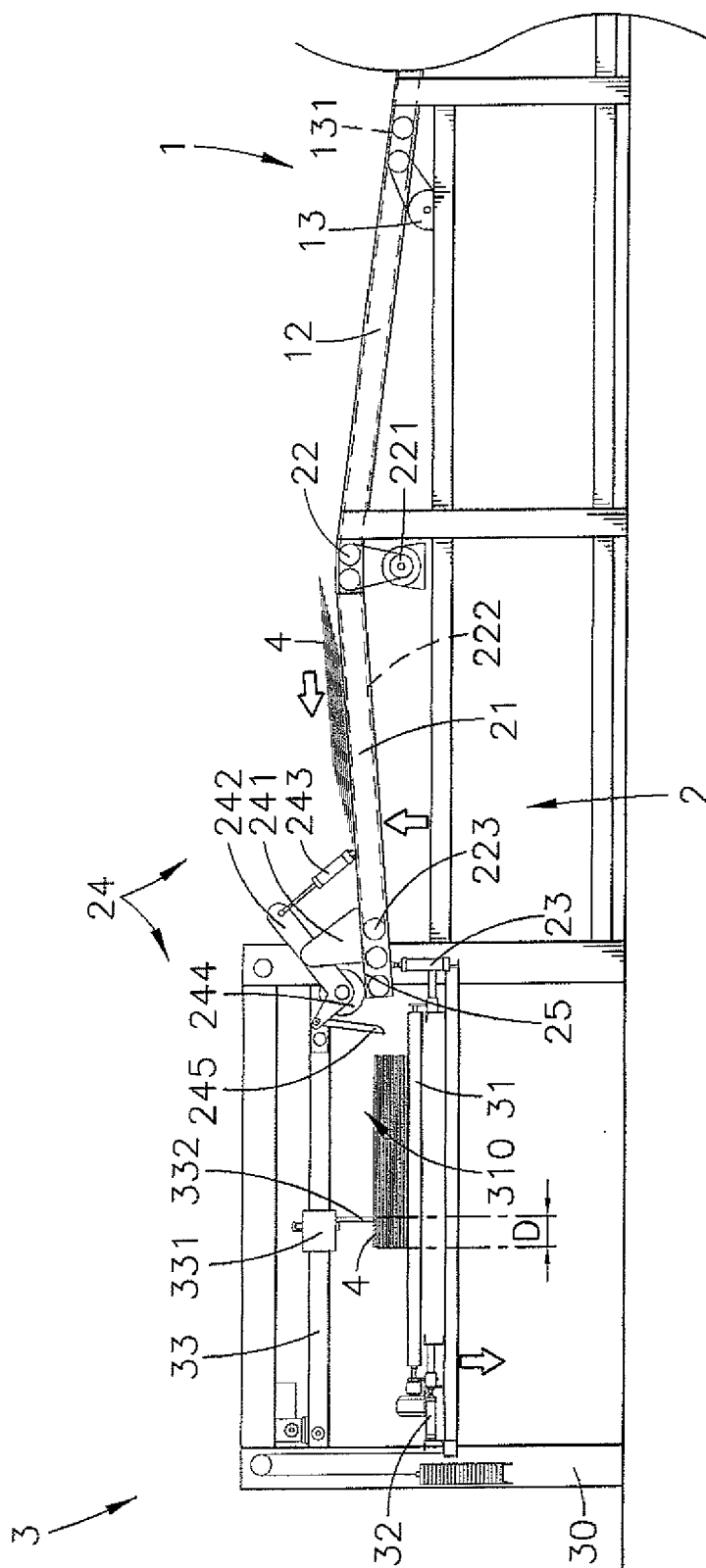


FIG. 4

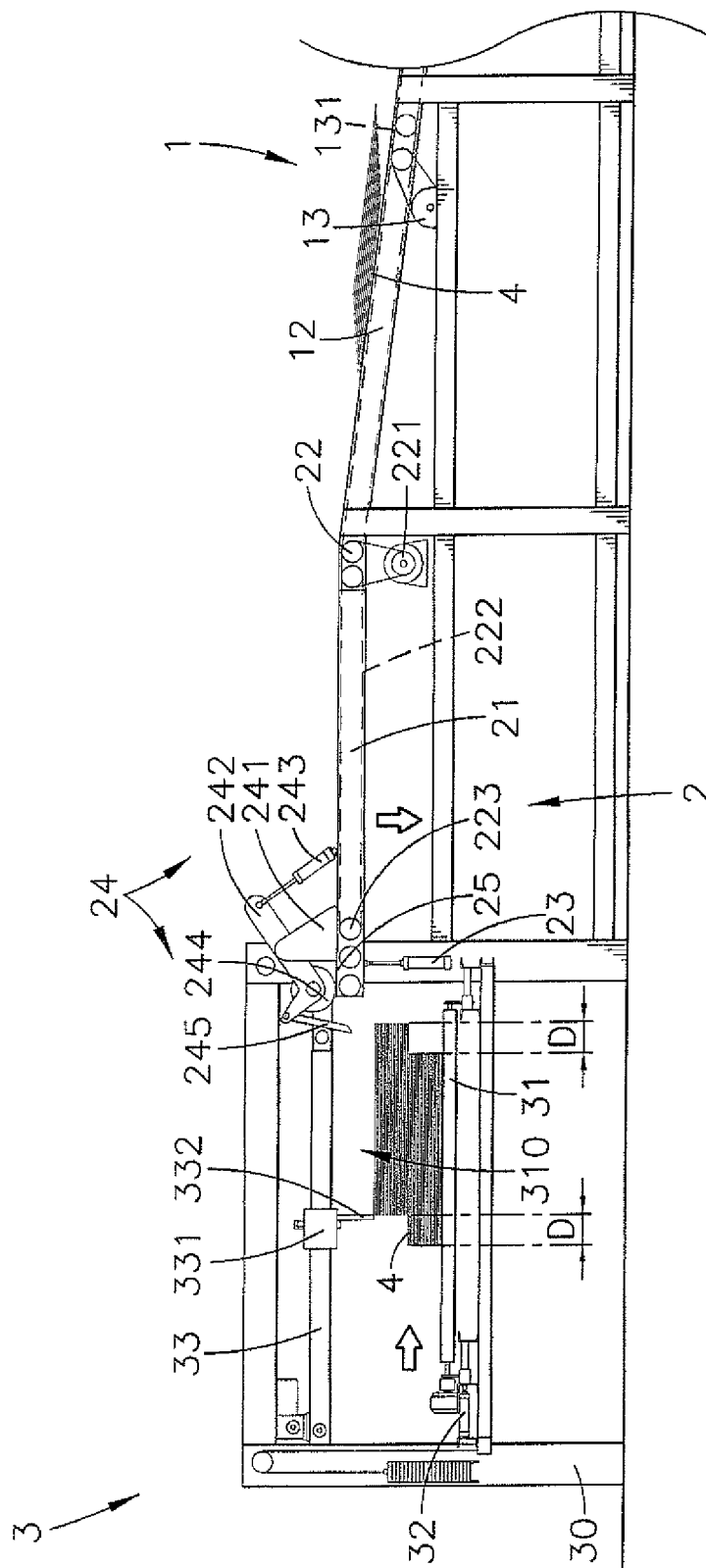


FIG. 5

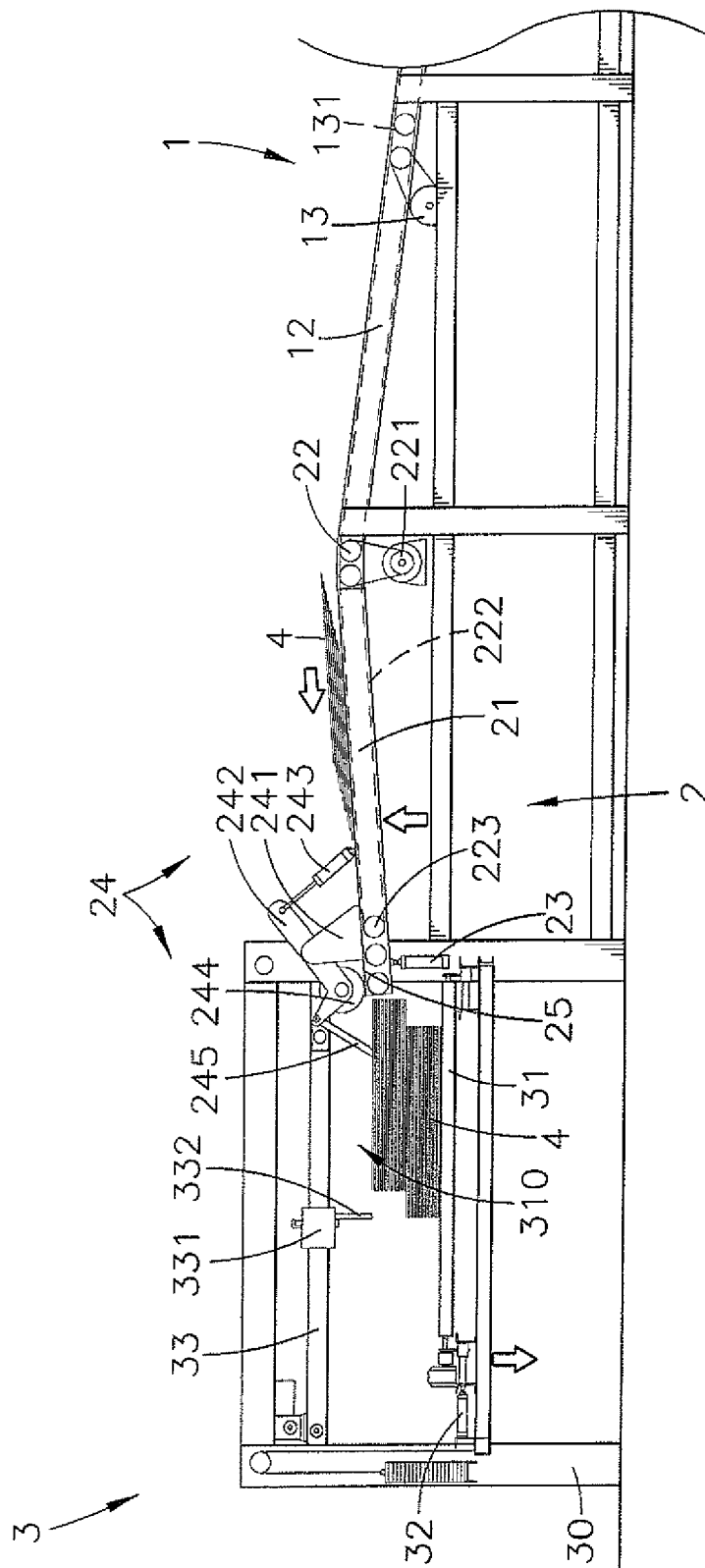


FIG. 6

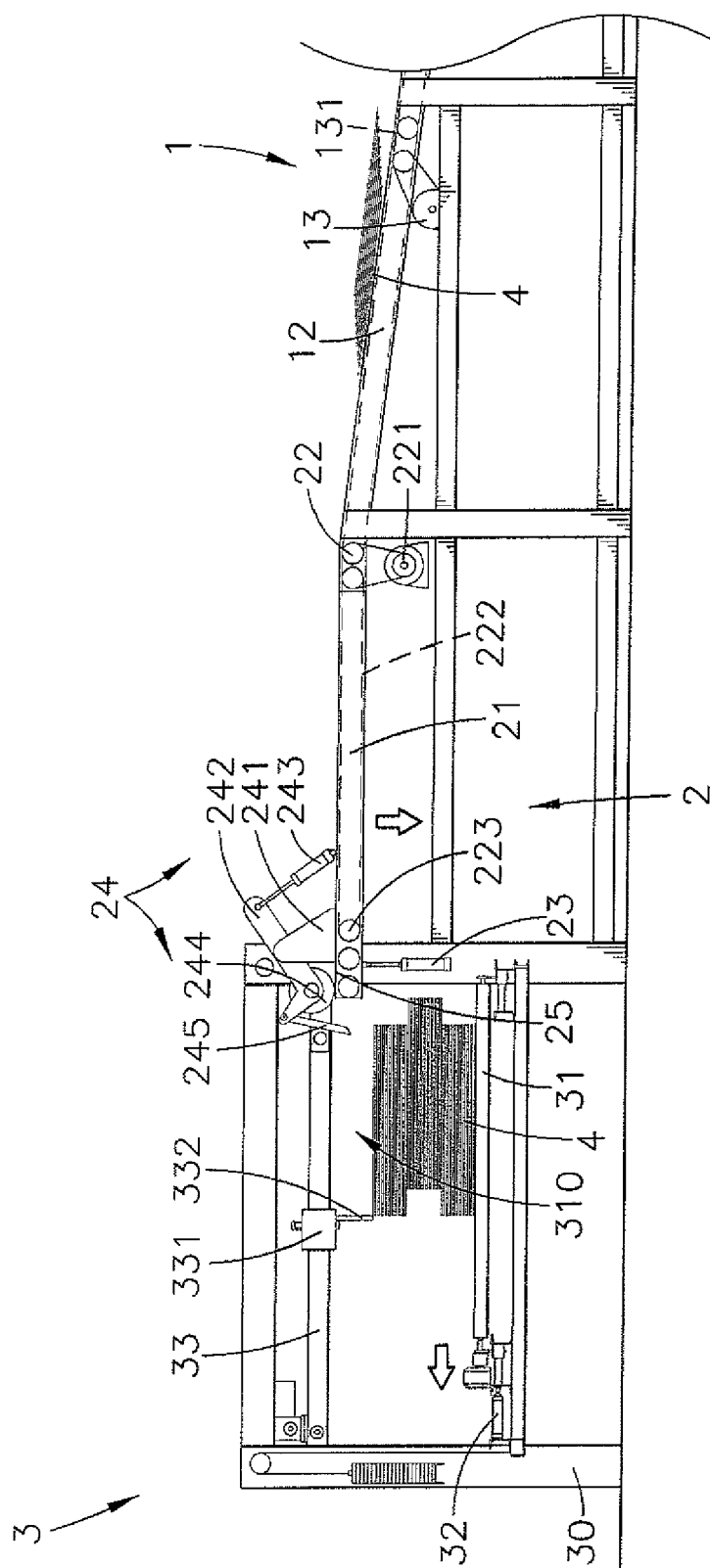
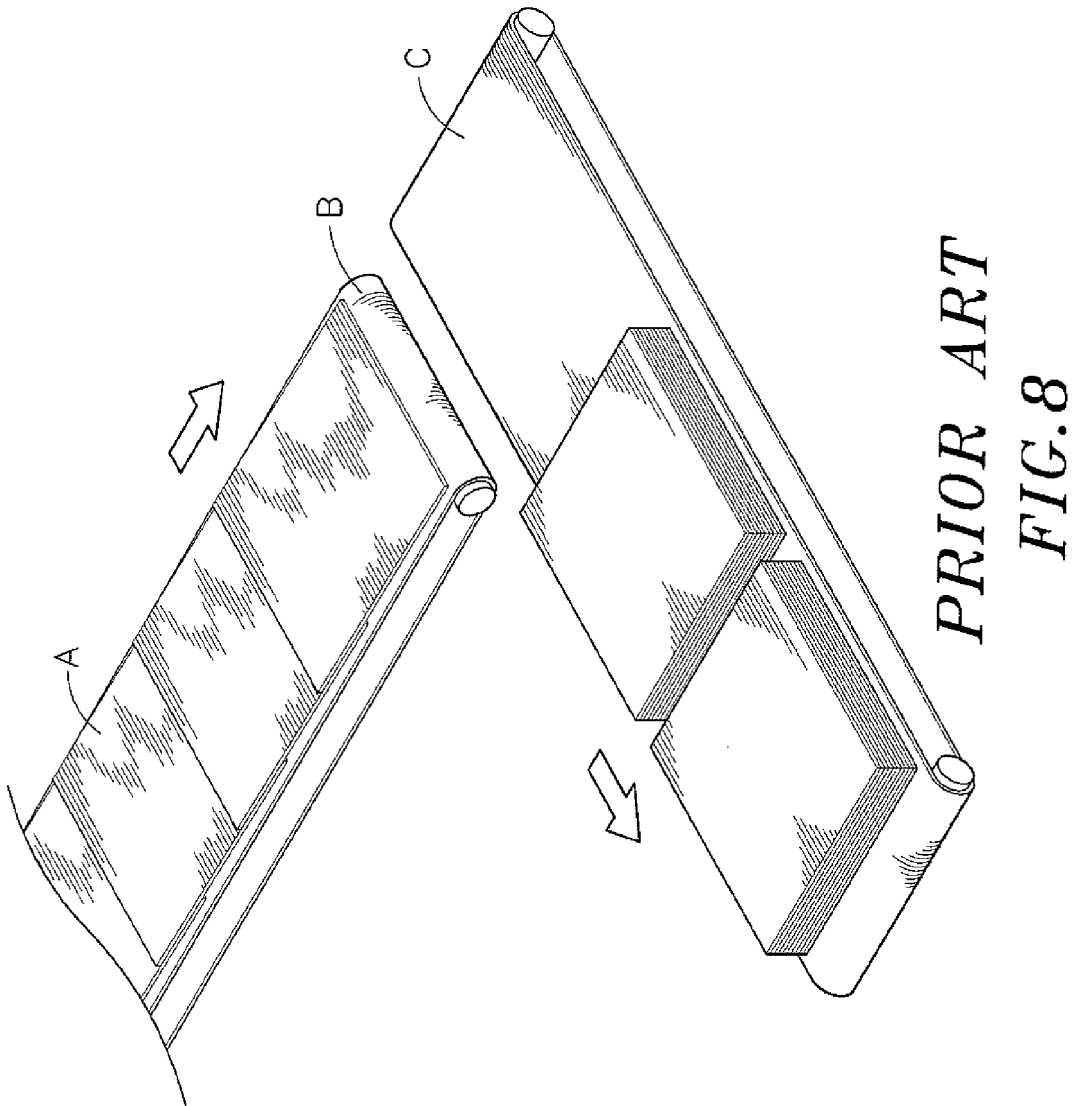


FIG. 7





EUROPEAN SEARCH REPORT

Application Number
EP 11 19 5614

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2009/169351 A1 (WU KUAN-SHIUNG [TW]) 2 July 2009 (2009-07-02) * the whole document *	1	INV. B65H31/10 B65H29/66 B65H29/14 B65G57/03 B26D7/32 B65H33/12
A	US 2005/079045 A1 (TALKEN DANIEL J [US] ET AL) 14 April 2005 (2005-04-14) * the whole document *	2	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H B65G B26D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 April 2012	Examiner Ureta, Rolando
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 L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04001)



Application Number

EP 11 19 5614

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-3

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 11 19 5614

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3

A paper sheet material receiving and stacking system, wherein the pieces of paper sheet material are corrugated or cardboard sheets, and wherein a conveyor frame, at which a motor driver is mounted, extends obliquely upwardly.

2. claim: 4

A paper sheet material receiving and stacking system, wherein a receiving and adjustment unit comprises at least one transmission roller, at least one steering roller, an endless conveying belt and a motor driver.

3. claims: 5, 6

A paper sheet material receiving and stacking system, wherein an adjustment mechanism comprises a bracket.

4. claims: 7, 8

A paper sheet material receiving and stacking system, wherein the transmission mechanism of a stacking unit comprises at least one of the sets of hydraulic cylinders, pneumatic cylinders, transmission gear sets, transmission chains and motor sets, and a paper sheet material receiving and stacking system wherein a stacking unit comprises a sliding track.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 19 5614

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-04-2012

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