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(71) Applicant:
Kleinnibbelink, Edgar, Bernardus
7573 CN Oldenzaal (NL)

(72) Inventor:
Kleinnibbelink, Niels Johannes
7573 CN Oldenzaal (NL)

(74) Representative:
Van den Heuvel, Henricus Theodorus
Arnold & Siedsma
Sweelinckplein 1
2517 GK The Hague (NL)

(54) Device and method for processing cardboard

(57) The invention relates to a device for processing cardboard, comprising:

- a loading station for cardboard,
- processing means, such as for instance printing means and/or box-forming means, and
- transport means connecting the loading station to the processing means.

The invention also relates to a method for processing stacked cardboard sheets.

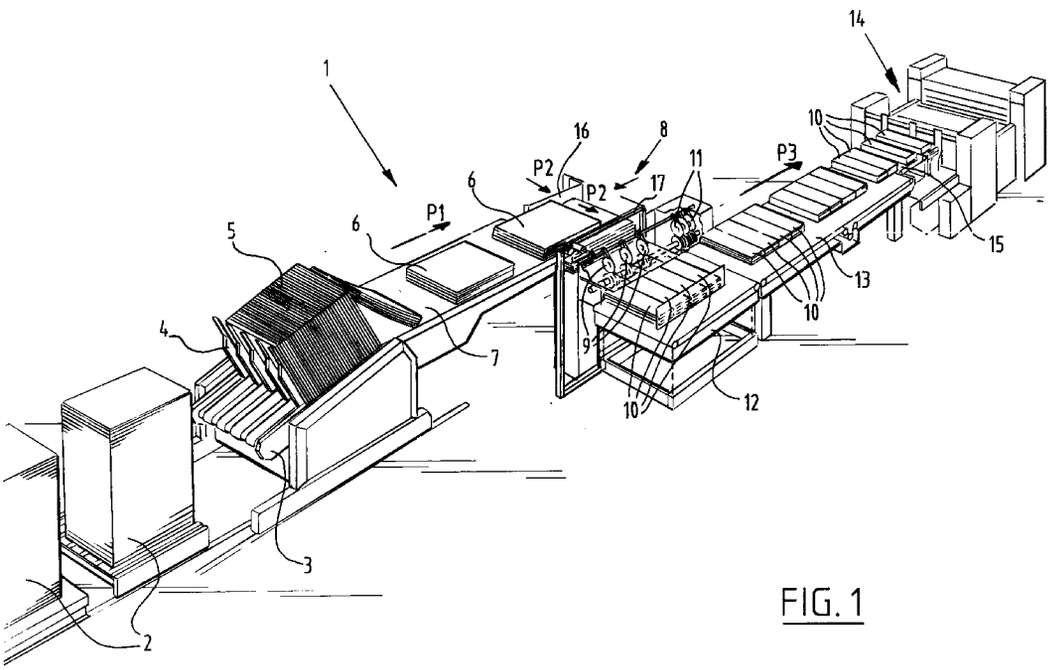

FIG. 1

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Description

The invention relates to a device for processing cardboard, comprising:

- a loading station for cardboard,
- processing means, such as for instance printing means and/or box-forming means, and
- transport means connecting the loading station to the processing means.

The invention also relates to a method for processing stacked cardboard sheets.

The existing devices and methods for processing cardboard, in particular corrugated cardboard, are characterized by a large feeding machine for continuous lengths of cardboard, which cardboard in continuous lengths is subsequently cut and stacked in stacks of cardboard in sheet form, wherein the dimensions into which the cardboard is cut depend on the final processing. The stacks of cut cardboard sheets are then placed in a buffer. Such a buffer generally contains stacks of cardboard sheets of varying dimensions. Generally placed some distance from the buffer is a plurality of processing machines, for instance for printing and forming into boxes of the cardboard sheets. The further processing lines usually have a smaller capacity than the capacity of the device in which the cardboard is cut. Mutual harmonizing of the processing lines and the device in which the cardboard is cut into sheets usually takes place manually in that personnel present on the shop floor place the stacks of sheets of cardboard into, and remove them from, the buffer. This is a relatively labour-intensive process wherein there is moreover the drawback that the stacks with relatively narrow strips of cardboard, such as are used for instance to manufacture cardboard boxes, will engage with each other. Herein must be envisaged at least two adjacent stacks of cardboard sheets which are gripped for instance on the underside when the stacks are moved to or from the buffer with a fork-lift truck, when such stacks are placed in a processing line or when the stacks are carried through the processing line. Owing to the fact that a stack is built up of separate cardboard sheets, there is in any case the danger that when the bottom sheet is displaced the mass inertia of the cardboard sheets lying on top will cause these sheets to shift slightly relative to the bottommost sheet. The side walls lying perpendicularly of the transporting direction of such a stack of cardboard sheets therefore usually display a curve in side view. When now a plurality of stacks of relatively narrow strips are placed at a short mutual distance, it may occur that a top sheet of a particular stack of cardboard sheets lies at least partly above the plane of the bottom cardboard sheet of an adjacent cardboard stack. This is undesirable because it makes further processing of the stack of cardboard sheets more difficult. Separation of the larger stack into sub-stacks for instance is hereby made very difficult. A solution for this problem is known in the prior art. A band is herein arranged round a stack of cardboard sheets. The arranging of such a band is relatively costly and usually renders the top and bottom cardboard sheets of a stack unusable since the edges are usually damaged by the band, as this must be arranged round the stack with the required bias. Another drawback of stacks with relatively narrow strips of cardboard is that as a result of the limited stability they can tip over.

The invention has for its object to provide an improved device and method with which partial sliding of adjacent stacks of cardboard sheets into each other can be prevented.

The invention provides for this purpose a device of the type stated in the preamble wherein cutting means are arranged between the loading station and the processing means for reducing the cardboard from the loading station to processable cardboard portions. The loading station is preferably a loading station for stacked cardboard in sheet form. Preferably placed between the loading station and the cutting means is a de-stacker for separating the cardboard stack placed in the loading station into sub-stacks. Loading station and de-stacker can also be combined in a feed device. By including cutting means in the device it is possible to load the device with cardboard sheets of relatively large dimensions. With such cardboard sheets the phenomenon as described above of adjacent cardboard stacks engaging with each other does not occur, or hardly so. The problem of cardboard stacks engaging with each other will therefore no longer occur, or hardly so, since the stacks are only cut shortly before they are processed in the processing device. There is therefore practically no time for the cardboard stacks with relatively narrow cardboard strips to deform. Another significant advantage lies in the fact that fewer stacks of cardboard sheets of varying dimensions have to be received in the buffer between the feed device and the processing device. This simplifies stock control, enables relatively lower stock levels and facilitates transport since relatively large quantities of cardboard can be moved simultaneously. Yet another advantage is the comparatively great stability of a stack with cardboard sheets of relatively large dimensions. Such a stack will not tip over, or only do so under very extreme conditions.

The cutting direction of the cutting means preferably runs substantially parallel to the transporting direction from the loading station to the processing means. In another preferred embodiment the cutting direction of the cutting means lies substantially perpendicular to the transporting direction from the loading station to the processing means. The most suitable cutting direction can be chosen subject to the space in which the device is placed, the form and orientation of the cardboard for processing in the processing device. In preferred embodiments, transport means connect onto the cutting means. The entire transport from the loading station to

the processing means must take place in automated manner, this in order to minimize the required operator hours.

In yet another preferred embodiment the cutting transport means are embodied such that they repeatedly take one or several sheets for cutting from a supplied stack and carry these along the cutting means. A stacker is preferably also placed in cutting direction behind the cutting means for stacking cut cardboard portions. Cutting of a relatively thick stack of cardboard sheets is difficult, requires expensive cutting means and entails a relatively high risk of damage to the cut cardboard portions. It is therefore recommended to cut the sheets to the desired dimensions separately or in smaller stacks.

The invention also comprises a method wherein the supplied cardboard sheets are cut in line into processable portions before being fed to the processing device. In preference the cutting direction herein lies substantially perpendicularly of the feed direction of the cardboard to the cutting device. It is also possible for the cutting direction to lie substantially perpendicularly of the feed direction of the cut cardboard to the processing device. The advantages of such a method have already been described with reference to the device according to the invention.

The present invention will be further elucidated with reference to the non-limitative embodiments shown in the following figures. Herein:

Fig. 1 shows a perspective view of a device according to the invention, and

Fig. 2 shows a perspective view of a part of the cutting means forming part of the device of fig. 1.

Fig. 1 shows a device 1 to which stacks of cardboard sheets 2 are fed. The device comprises a tiltable frame part 3 to which support arms 4 are fixed, on which support arms 4 lies a stack of cardboard sheets 5 for processing. For placing of stack 5 on support arms 4 the frame part 3 must be situated in substantially vertical position. The support arms are herein placed in a lowest position. After stack 5 has been placed on support arms 4 the tiltable frame part will be pivoted and support arms 4 will be moved uniformly upward. A stack part 6 will herein always be engaged by a conveyor belt 7. The transporting direction of conveyor belt 7 is indicated with arrow P1. Connecting onto conveyor belt 7 on the side remote from frame part 3 is the cutting device 8 for cutting the cardboard sheets present in stack parts 6, which sheets are moved as according to arrows P2 in a direction substantially perpendicular to the transport direction P1. They are herein gripped by cutting discs 9. The passage through cutting device 8 results in stacks of cut cardboard sheets 10. Subject to the desired dimensions of the stacks of cut cardboard sheets 10, additional cutting discs 11 can be placed in the possible transport path of cutting device 8 or at least one cutting disc 9 can be displaced out of the transport path of cutting device 8 to the additional cutting discs 11. Depending on cutting device 8, one or more sheets are cut simultaneously. When the stack of sheets for cutting is smaller than the number of sheets situated in the stack part 6, it is recommended to connect a stacker 12 onto the cutting device 8. The cut cardboard sheets can then be placed in stacks of cut cardboard sheets 10 of the desired height. Because the stacks of cut cardboard sheets 10 have reached the desired height, they will be fed with a conveyor belt 13 to a further processing device 14 as according to an arrow P3. The processing device 14 can consist for instance of a printing device or a device for manufacturing cardboard boxes. This figure also shows that, shortly before the stacks of cut cardboard sheets 10 are fed to the processing device 14, they are separated from each other by a conveyor belt 15 connecting onto conveyor belt 13. This conveyor belt 15 can for instance be driven at a higher speed than conveyor belt 13.

Fig. 2 shows a detail view of a part of the cutting device. Placed above the conveyor belt 7 shown in fig. 1 is a plate 16 with which stack parts 6 can be displaced in the direction P2. This plate 16 is supported by a beam 17, which beam is displaceable by operating a cylinder 18 as according to arrow P4. As soon as a stack part 6 has been displaced sufficiently in the direction P2, a bottom sheet 19 of the stack part 6 will be engaged by a friction wheel 20 which rotates as according to arrow P5. The friction wheel 20 is provided with a central groove 21 above which is placed a cutting disc 9. Due to the movement of the bottom sheet as according to arrow P2 the cutting disc, when pressed downward sufficiently by the arm 22, will cut through the sheet 19. The friction wheel 20 is driven by a drive which is not shown in this figure. In order to adjust the position of both cutting disc 9 and friction wheel 20 it is possible to move as according to arrow P6 a shaft 23 on which arm 22 engages such that cutting disc 9 is moved clear of cardboard sheet 19. It is then possible as according to arrows P7 and P8 to alter the position at which the arm 22 engages on shaft 23 after a fixing bolt 24 has been loosened. When the desired position of cutting disc 9 has been reached, the bolt 24 must be re-tightened. The displacement of friction wheel 20 must correspond with the displacement of cutting disc 9. For this purpose the cutting wheel 9 can be displaced as according to arrow P9 after loosening of the bolt 25.

An alternative to the detail view shown in fig. 2 comprises at least one driven cutting disc 9. A driven friction wheel 20 for co-action with cutting disc 9 herein becomes unnecessary. In the case of the driven cutting disc 9, it is only necessary to support the sheet 19 in a manner such that at least one groove-like space is left clear beneath the driven cutting disc 9.

For the sake of clarity it is stated that only one preferred embodiment is described here, the scope of protection sought by this application being specified by the

claims.

Claims

1. Device for processing cardboard, comprising:

   - a loading station for cardboard,
   - processing means, such as for instance printing means and/or box-forming means, and
   - transport means connecting the loading station to the processing means, wherein cutting means are arranged between the loading station and the processing means for reducing the cardboard from the loading station to processable cardboard portions.

2. Device as claimed in claim 1, wherein the loading station is a loading station for stacked cardboard in sheet form.

3. Device as claimed in claim 2, wherein a de-stacker is placed between the loading station and the cutting means for separating a cardboard stack placed in the loading station into sub-stacks.

4. Device as claimed in claim 3, wherein the loading station and the de-stacker are combined in one feed device.

5. Device as claimed in any of the foregoing claims, wherein the cutting means comprise at least one rotatable cutting disc.

6. Device as claimed in any of the foregoing claims, wherein the cutting direction of the cutting means runs substantially parallel to the transporting direction from the loading station to the processing means.

7. Device as claimed in any of the claims 1-5, wherein the cutting direction of the cutting means lies substantially perpendicular to the transporting direction from the loading station to the processing means.

8. Device as claimed in claim 7, wherein the cutting device comprises cutting transport means for displacing the cardboard for cutting from a first conveyor belt, from the loading station to the cutting means, in a direction substantially perpendicular to the transporting direction of the first conveyor belt.

9. Device as claimed in claim 8, wherein a second conveyor belt connects onto the cutting device for displacing the cut cardboard leaving the cutting means from the cutting transport means to the processing means in a direction substantially perpendicular to the cutting direction.

10. Device as claimed in any of the claims 7-9, wherein the cutting transport means are embodied such that they repeatedly take one or several sheets for cutting from a supplied stack and carry these along the cutting means, and a stacker is placed in cutting direction behind the cutting device for stacking cut cardboard portions.

11. Method for processing stacked cardboard sheets, wherein the supplied cardboard sheets are cut in line into processable portions before being fed to the processing device.

12. Method as claimed in claim 11, wherein the cutting direction lies substantially perpendicularly of the feed direction of the cardboard to the cutting device.

13. Method as claimed in claim 11 or 12, wherein the cutting direction lies substantially perpendicularly of the feed direction of the cut cardboard to the processing device.

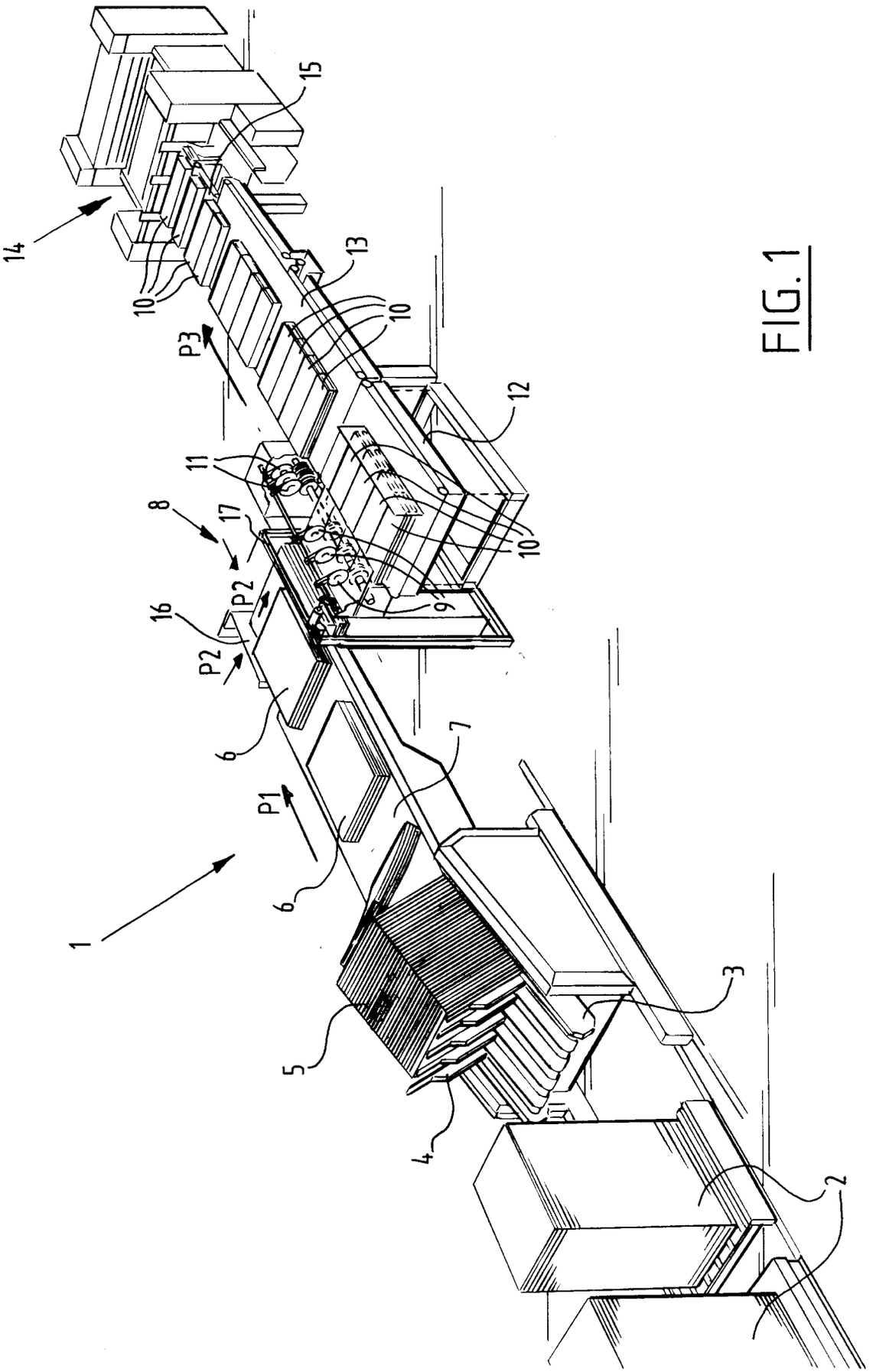

FIG. 1

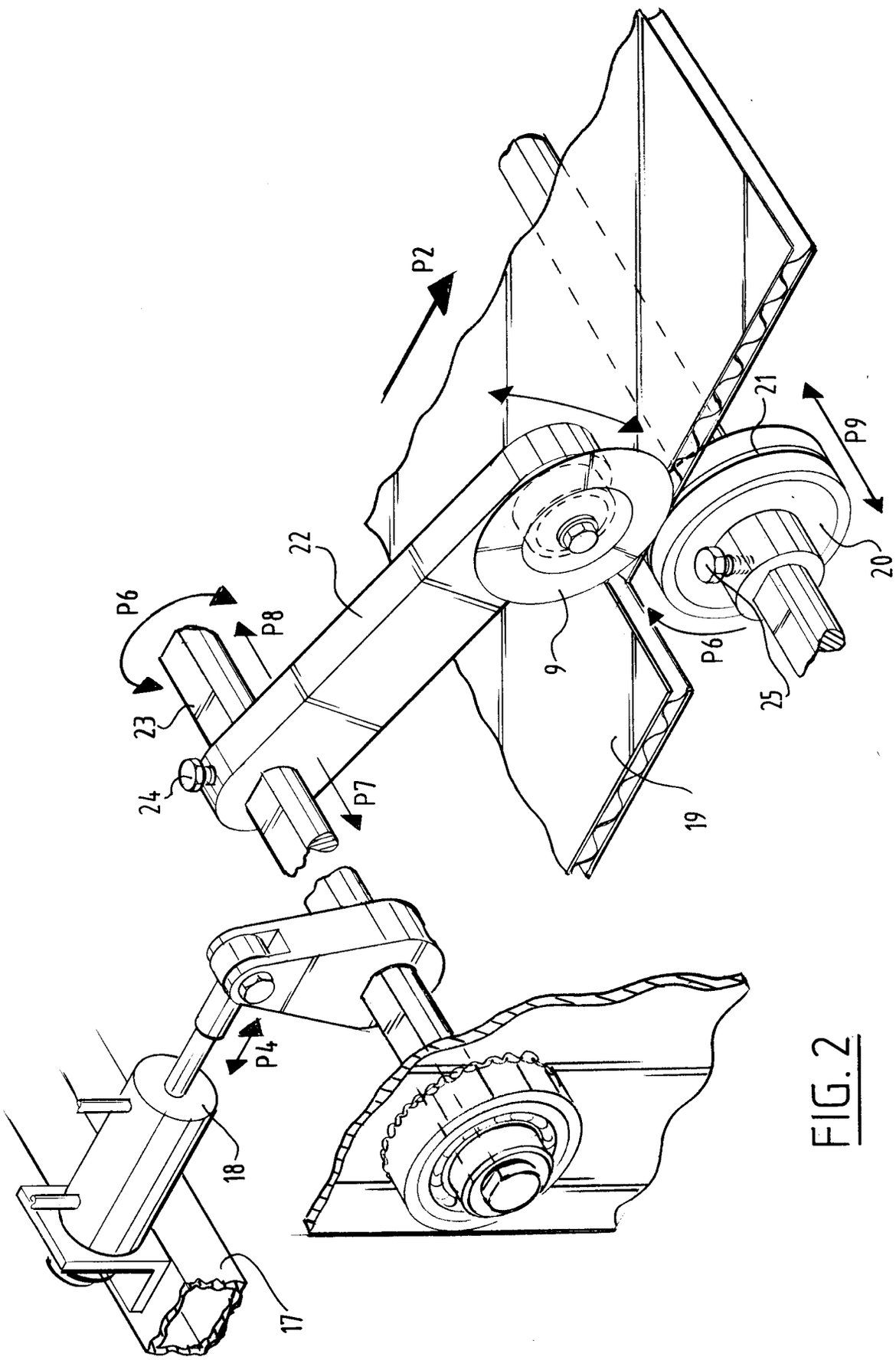

FIG. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0095

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.6)
X	US 1 464 649 A (EVERS ARTHUR J ET AL) 14 August 1923 * page 1, line 31 - line 37 * * page 5, line 52 - line 125 *	1-13	B31B1/20 B65H35/00
X	DE 44 21 011 A (SCHNABEL GERHARD) 4 January 1996 * claims; figure 1 *	1,5,11	
A	US 5 165 314 A (PAULSON RICHARD F ET AL) 24 November 1992 * column 6, line 48 - column 7, line 19; figures 1-4 *	1,5,11	
A	DE 29 11 473 A (H J DUERSELEN KG) 25 September 1980		
A	US 5 483 856 A (SMITTERBERG DEAN W ET AL) 16 January 1996		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B31B
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 April 1998	Pipping, L

CATEGORY OF CITED DOCUMENTS

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